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Pollution Markets and Social Equity: Analyzing the Fairness of Cap and Trade

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This Article considers three fairness issues relating to a cap-and-trade system: fairness to industry, fairness to communities disproportionately impacted by pollution, and fairness to low-income energy consumers. First, assuming any compensation of industry is warranted, free allowances would overcompensate firms for the cost of achieving emission reductions; industry should not receive effective ownership of the atmosphere at the public's expense. Second, environmental justice advocates argue that cap-and-trade systems generate pollution hot spots and encourage dirtier plants to continue operating to the detriment of certain disadvantaged communities. However, cap and trade has no intrinsic tendency to produce increased emissions in disadvantaged communities. Designers of cap-and-trade systems nevertheless should be alert to possible hot spots, particularly in low-income and minority communities. If hot spots are expected or emerge during the operation of the program, responses could include creating geographic grading zones, imposing ceilings on emissions in addition to the cap-and-trade scheme, or prohibiting certain sources from purchasing allowances. Third, any regulation of emissions raises costs, which has a disproportionate impact on low-income consumers. This effect can be greatly ameliorated through adroit use of revenue from emissions allowance auctions to offset the additional burden on low-income consumers from increased energy costs. The bottom line is that fairness issues are not a deal-breaker for cap and trade, but they do deserve thoughtful consideration in designing a system.

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INTRODUCTION

Cap and trade is a common part of proposals to reduce greenhouse gas emissions[1] and economists promote it as a cost-reduction measure.[2] However, use of cap-and-trade systems is controversial, in part because of concerns about fairness. For instance, environmental justice[3] advocates who focus on pollution

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1. *See generally* David M. Driesen, *Sustainable Development and Market Liberalism's Shotgun Wedding: Emissions Trading Under the Kyoto Protocol*, 83 IND. L.J. 21 (2008) (describing the international use of cap-and-trade programs); *see also* SERGEY PALTSEV ET AL., MIT JOINT PROGRAM ON THE SCIENCE AND POLICY OF GLOBAL CHANGE, ASSESSMENT OF U.S. CAP-AND-TRADE PROPOSALS 2 (2007), *available at* http://web.mit.edu/globalchange/www/MITJPSPGC_Rpt146.pdf (stating that "[a] number of alternative approaches to greenhouse-gas mitigation are under consideration in the United States, but the policy instrument now receiving greatest attention is a national cap-and-trade system"). The MIT report provides a good introduction to the design issues involved in creating such a system and to methods for estimating costs associated with a cap-and-trade system. *See id.* at 3–9.

2. *See, e.g.*, Robert W. Hahn & Gordon L. Hester, *Marketable Permits: Lessons for Theory and Practice*, 16 ECOLOGY L.Q. 361, 362 (1989).

3. For an introduction to environmental justice (EJ), see generally Richard J. Lazarus, *Pursuing "Environmental Justice": The Distributional Effects of Environmental Protection*, 87 NW. U. L. REV. 787 (1993). Sean Hecht describes the environmental justice perspective in the following way:

> The EJ movement's primary goal is to lessen the [dis]proportionate burdens on low-income and minority communities from human-created environmental risks. At the same time, the EJ community has an abiding commitment to process-oriented goals, too. These goals include integrating public participation and community-based knowledge and values into decisionmaking at the level of individual decisions about how best to regulate activities,

problems in disadvantaged communities argue that "evaluation of the world's oldest and largest pollution trading programs for urban air quality reveals immorality, injustice, and ineffectiveness in their outcomes."[4] Critics argue that "many market-based approaches are designed in a way that will inevitably treat low-income communities unfairly."[5] On the other hand, some scholars view these criticisms as misguided obstacles to necessary environmental measures, particularly when environmental justice advocates use litigation against environmental agencies to block specific efforts to control greenhouse gases.[6] What makes the controversy so poignant is that proponents of these

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> projects, plants, and environmental and land use decisions that might affect local community health. The movement regards community participation in regulatory decisions as among its most cherished values. It is a core belief of EJ advocates that a process lacking in community engagement at the project or plant level cannot lead to a sustainable long-term set of solutions to the environmental inequities they are trying to eradicate—even if some decisions good for the environment or even for EJ stakeholders might sometimes result from a process without community engagement.

Sean Hecht, *Reflections on Environmental Justice and AB 32's Emissions Trading Program*, LEGAL PLANET (Mar. 23, 2011), http://legalplanet.wordpress.com/2011/03/23/reflections-on-environmental-justice-and-ab-32s-emissions-trading-program/.

4. Richard Toshiyuki Drury et al., *Pollution Trading and Environmental Injustice: Los Angeles' Failed Experiment in Air Quality Policy*, 9 DUKE ENVTL. L. & POL'Y F. 231, 289 (1999). Similarly, another advocate of environmental justice contends that

> the irrefutable fact remains that industrial facilities are overwhelmingly located in places inhabited by people who cannot afford to move to cleaner surroundings. Allowing these sources to purchase allowances in a market-based system in order to avoid the cost of retrofitting their plants with pollution control devices will cause spikes in the levels of pollution in the vicinity of the plant.

Rena Steinzor, *Toward Better Bubbles and Future Lives: A Progressive Response to the Conservative Agenda for Reforming Environmental Law*, 32 Envtl. L. Rep. (Envtl. Law Inst.) 11,421 (2002), *available at* http://digitalcommons.law.umaryland.edu/cgi/viewcontent.cgi?article=1860&context=fac_pubs. On this basis, in 2008, "environmental justice groups from California issued a declaration against cap-and-trade, stating that pollution already disproportionately affects low-income, [sic] communities of color, and they will 'fight at every turn' against regulations that create a carbon-trading system that would only exacerbate those trends." Kate Sheppard, *Environmental Justice v. Cap-and-Trade*, AM. PROSPECT (Feb. 28, 2008), http://prospect.org/article/environmental-justice-v-cap-and-trade. More specifically, the declaration describes opposition to "a carbon trading *and offset* program." *The California Environmental Justice Movement's Declaration on Use of Carbon Trading Schemes to Address Climate Change*, EJ MATTERS, http://www.ejmatters.org/declaration.html (last visited Jan. 23, 2012) (emphasis added).

5. Stephen M. Johnson, *Economics v. Equity: Do Market-Based Environmental Reforms Exacerbate Environmental Injustice?*, 56 WASH. & LEE L. REV. 111, 118 (1999).

6. For example, in discussing litigation surrounding the development of an emissions trading scheme in California, Ann Carlson explained:

> I should note that I'm quite sympathetic to concerns by environmental justice groups about reducing air pollution from large sources in California. And in fact a number of the measures CARB [the California Air Resources Board, which implements the state's greenhouse gas program] has included in its scoping plan should help on the air pollution front: aggressive moves to cut greenhouse gases from automobiles should also produce cleaner cars; the state's requirement that utilities get 33 percent of their energy from renewable sources by 2020 should do the same. But I also think that the focus of AB 32 should mainly be on reducing greenhouse gases. Other statutes require very strict limits on air pollution, including both the federal Clean Air Act and the state's own air pollution laws. Those are the statutes that should be used to regulate air pollution directly. CARB should have as much flexibility as

differing viewpoints generally agree on the goals of environmental quality and social justice; however, they vehemently disagree about how to prioritize these goals and whether environmental justice concerns ought to be addressed through greenhouse gas policy design or through a different type of regulation.

In order to understand the controversy, it is first necessary to understand what cap and trade entails: it is an emissions-reduction method that sets a rigid cap on emissions of a target pollutant for a constellation of regulated entities but also leaves them significant discretion to decide how to comply.[7] An emissions trading scheme is based on the issuance of emissions allowances,[8] which allow a firm that reduces its emissions to profit by selling unneeded allowances to other present or prospective emitters or occasionally to nonemitters entering the allowances market for speculative or environmentalist purposes.[9] Most trading systems limit the duration of permits to some specified time, such as one year, but some systems allow banking permits for future use or borrowing permits from future allocations to cover current emissions.[10] The

> possible to implement AB 32 with a focus on reducing greenhouse gases as cost effectively as possible. If it can do so by also maximizing co-benefits like air pollution they should do so but the board's central focus should remain greenhouse gas emission reduction.

Ann Carlson, *AB 32 Lawsuit: Assessing the Environmental Justice Arguments Against Cap and Trade*, LEGAL PLANET (Mar. 22, 2011), http://legalplanet.wordpress.com/2011/03/22/ab-32-lawsuit-assessing-the-environmental-justice-arguments-against-cap-and-trade/. Another observer suggested more simply that "the EJ folks want to make life difficult enough for CARB that the Board gives in and gives their constituency something." Jonathan Zasloff, *Two Cheers for Environmental Justice Cynicism*, LEGAL PLANET (Mar. 23, 2011), http://legalplanet.wordpress.com/2011/03/23/two-cheers-for-environmental-justice-cynicism/. Zasloff added: "If you don't like that attitude, you call it a shakedown; if you do like it, then you call it leverage." *Id.* In his view, this leverage comes at a price:

> AIR [the environmental justice group] is taking a real risk here: either they don't have leverage, in which case CARB will re-analyze and just move ahead, or they *do* have leverage, in which case the program might go defunct (I'm doubtful of this, but at some level AIR must believe this is a possibility). And since the prime victims of climate change will be low-income people of color in the Global South, calling it "environmental justice" in those circumstances will be, shall we say, ironic.

Id. Environmental justice advocates obviously take a much different view and would reject some of the assumptions underlying these criticisms. Sean Hecht presents a more sympathetic response to the environmental justice position on AB 32. Hecht, *supra* note 3. This range of opinions indicates the level of controversy surrounding the issue.

7. *See, e.g.*, *Cap and Trade*, U.S. EPA, http://www.epa.gov/captrade/ (last updated Aug. 12, 2010). Note that "cap and trade" and "emissions trading system" are alternative terms for the same set of policies. This Article will use the two terms interchangeably.

8. An allowance authorizes the holder to emit a given unit of emissions—often one ton—during a given time period—generally one year, although sometimes longer. *See, e.g.*, CAL. HEALTH & SAFETY CODE § 38505(a) (West 2011) (defining "allowance").

9. *See* Hahn & Hester, *supra* note 2, at 363–66 (providing a conceptual overview of emissions trading). A related concept is the use of transferable fishing quotas to help maintain sustainable fish stocks. *See* David Dana, *Overcoming the Political Tragedy of the Commons: Lessons Learned from the Reauthorization of the Magnuson Act*, 24 ECOLOGY L.Q. 833 (1997); Kristen M. Fletcher, *When Economics and Conservation Clash: Challenges to Economic Analysis in Fisheries Management*, 31 Envtl. L. Rep. (Envtl. Law Inst.) 11,168 (2001).

10. *See* Lesley K. McAllister, *The Enforcement Challenge of Cap-and-Trade*, 40 ENVTL. L. 1195, 1200 (2010).

initial permit holders may be chosen in several ways: permits may be allocated among existing polluters for free or for a price, or they may be allocated among broader groups of applicants by auction or lottery. Once the pollution permits have been initially allocated, they are transferable, and sale prices function as free-market equivalents of pollution taxes. The permits have scarcity value because emissions are subject to an overall cap that, market-wide, is below current emissions or below emissions increases that would be expected under business as usual.

To see the basic argument for a trading system, suppose that the government has decided to reduce levels of a hypothetical air pollutant that is well-mixed in the atmosphere so that a reduction anywhere is, effectively, a reduction everywhere. In this scenario, the central policy question is how to reach the emissions reduction goal cost-effectively, since the government has already decided how much to reduce emissions and the effects are felt equally everywhere. The government could achieve the desired emissions reduction by using direct regulation to set emissions standards for individual emissions sources, but this could be costly and time consuming.[11] However, because it does not matter *where* on the planet emissions reductions happen, a better alternative might be to set an overall limit on total emissions (a "cap"), allocate emissions permits to pollution sources (for example, power plants), and then let polluters trade permits among themselves so that the emission reductions will come from the sources that can most cost-effectively reduce their emissions.[12]

The cap determines the total emissions reduction, while the trading process determines which sources reduce their emissions and to what extent. For example, assume that one source (*A*) can eliminate one ton of emissions at a cost of $1000, while another source (*B*) can do so for $500. *A* would come out ahead by buying an allowance to emit one ton of the pollutant from *B* for

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11. Direct regulation can be a cumbersome process, with many opportunities for judicial review as each regulation is issued. It also requires the government to determine the best way for industry to reduce emissions, although industry itself is likely to have a more complete understanding of its own costs and technological opportunities. Oliver Houck, a staunch environmentalist, describes the challenges of some specific technology-based standards vividly:

> The development of technology standards was the most Herculean task ever imposed on an environmental agency. EPA had literally to master the economics, engineering, and technology in the most industrialized and [then] fastest-growing economy in world history. It had to learn state-of-the-art and potential alternative technologies for each process. It had to be able to defend its technology-forcing conclusions against the most experienced engineers, economists and lawyers money could buy. Every draft standard EPA proposed was subject to intense scrutiny, lobbying, and opposition from the affected industry and, within the limits of its resources, at least one organization. Nearly every final standard was immediately taken to court.

Oliver A. Houck, *The Regulation of Toxic Substances Under the Clean Water Act*, 21 Envtl. L. Rep. (Envtl. Law Inst.) 10,528, 10,537 (1991).

12. *See, e.g.*, Hahn & Hester, *supra* note 2, at 368–69 (describing cap and trade).

between \$500 and \$1000 dollars.[13] In this scenario, *A* would maintain its current emissions level and would achieve compliance through the purchase of the allowance, but *B* would cut its emissions by one ton while making a profit from the sale of the allowance. After a series of such trades, a competitive market should reach the point where no further trades are possible because total emissions control costs have been reduced as much as possible. Although real-world trading systems have additional bells and whistles, as well as transactional inefficiencies, this simple version of a cap-and-trade system illustrates the heart of the idea[14]: using emissions trading to achieve reductions has the potential to reduce overall costs relative to direct regulation.

Even when a cap-and-trade system operates as planned, fairness-based objections might arise. Some sources would end up buying emissions rights and others would sell them, leaving some richer than others.[15] The distribution of winners and losers would depend on the initial allocation process, and at least some sources might view this process and its result as unfair.[16] Furthermore, while our hypothetical pollutant is generally well mixed in the atmosphere, high-emission sources could end up concentrated in limited geographic areas after the trading process, leading to undesirably high local levels of the target pollutant (hot spots).[17] In this case, less well-mixed co-pollutants produced along with the traded emissions would be even more concentrated.[18] Finally, the costs of reducing pollutant emissions are likely to be passed on to consumers in the form of higher energy bills and more expensive products, which poses a special hardship for low-income communities.[19]

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13. This is because *B* would profit from selling its credit at anything over \$500 (not considering transaction costs), and *A* would in essence profit by buying at any amount less than \$1000.

14. In the law review literature, the classic article favoring cap and trade is Bruce Ackerman & Richard Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333 (1985). A carbon tax is another option, but since it lacks an enforceable cap, emissions reductions would be uncertain.

15. *See* discussion *infra* Part II.

16. *See* discussion *infra* Part II.

17. *See* discussion *infra* Part III.

18. *See* discussion *infra* Part III. As Alice Kaswan explains:

> While CO_2 emissions do not raise direct distributive justice concerns, they implicate distributive justice because CO_2 emissions do not occur in a vacuum. The combustion that generates CO_2 also generates a range of harmful co-pollutants, including criteria pollutants like particulates, sulfur oxides, nitrogen oxides (NO_x), ozone precursors, and carbon monoxide (CO), as well as a wide range of toxic pollutants, including many volatile organic compounds (VOCs), benzene, and other toxics.

Alice Kaswan, *Environmental Justice And Domestic Climate Change Policy*, 38 Envtl. L. Rep. (Envtl. Law Inst.) 10,287, 10,298 (2008).

19. *See* discussion *infra* Part IV.

This Article focuses on the social equity[20] implications of emissions trading.[21] It does not attempt to assess the economic benefits, effectiveness, or political viability of using an emissions trading system versus alternatives such as pollution taxes or direct regulation of sources.[22] Although overall program effectiveness is an important issue, it is not emphasized here so that the Article can instead focus more closely on the possible disparate effects of cap-and-trade programs on various socioeconomic groups.[23] Equity and effectiveness are distinguishable aspects of policy evaluation.[24] Equity relates to the uneven impact of a program on different groups or individuals, whereas effectiveness relates to whether the program achieves its primary goal. For instance, one might oppose capital punishment for fairness reasons (differential racial impacts or the past incidences of and continued potential for execution of the innocent), because of doubts about its actual deterrent effect, or both. Although the two issues may sometimes overlap,[25] separating equity from effectiveness

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20. "Social equity" is a broad term. The National Academy of Public Administration defines it as "[t]he fair, just and equitable management of all institutions serving the public directly or by contract; the fair, just and equitable distribution of public services and implementation of public policy; and the commitment to promote fairness, justice, and equity in the formation of public policy." *Standing Panel on Social Equity in Governance*, NAT'L ACAD. PUB. ADMIN., http://www.napawash.org/fellows/standing-panels/standing-panel-on-social-equity-in-governance/ (last visited Jan. 23, 2012).

21. Much of the discussion applies generally to cap and trade schemes, but some is specifically directed at the use of cap and trade for greenhouse gases.

22. For instance, the Article does not address the enforcement issues connected with environmental trading systems. *See generally* Lesley K. McAllister, *The Enforcement Challenge of Cap-and-Trade Regulation*, 40 ENVTL. L. 1195 (2010). For discussion of design issues involved in cap and trade systems, see Susan J. Kurkowski, *Distributing the Right to Pollute in the European Union: Efficiency, Equity, and the Environment*, 14 N.Y.U. ENVTL. L.J. 698 (2006); Lesley K. McAllister, *Beyond Playing "Banker": The Role of the Regulatory Agency in Emissions Trading*, 59 ADMIN. L. REV. 269 (2007); Jonathan Remy Nash & Richard L. Revesz, *Markets and Geography: Designing Marketable Permit Schemes to Control Local and Regional Pollutants*, 28 ECOLOGY L.Q. 569 (2001); Benjamin K. Sovacool, *The Policy Challenges of Tradable Credits: A Critical Review of Eight Markets*, 39 ENERGY POL'Y 575 (2011); Byron Swift, *Emissions Trading and Hot Spots: A Review of Major Programs*, 35 Env't Rep. (BNA) 1020 (2004).

23. Just to be clear, this Article is not intended to endorse cap and trade as being preferable to emission taxes or conventional regulation, whether in the context of greenhouse gases or otherwise. Any one of these approaches may function well in some contexts but not others, and whether an approach works well depends heavily on the specifics of how the approach is implemented.

24. Alice Kaswan highlights the different priorities placed on effectiveness and equity:

> As environmental policies, environmental justice and market-based theories are diametrically opposed. Market-based systems are designed to achieve aggregate reductions; they are distribution-neutral. The efficiency of pollution reduction is key; spatial distribution is not. In the world of environmental justice, in contrast, distributive justice is key: the issue is who suffers the impacts of pollution. Economic efficiency is less important than distributional fairness.

Kaswan, *supra* note 18, at 10,294.

25. There are two possible interconnections. First, if a cap and trade system would result in hot spots of the targeted pollutant, that may be a problem from both the perspective of effectiveness (levels of the targeted pollutant are not being reduced properly) and in terms of fairness. In the case of CO_2, however, hot spots are generally not thought to be a pressing issue. *But see* Jessica Leber, *Can Local 'Domes' of Carbon Dioxide Affect Human Health?*, SCI. AM. (Mar. 17, 2010), http://www.scientificamerican.com/article.cfm?id=can-carbon-dioxide-domes-affect-health. Second, if a cap-and-

promotes analytical clarity. In any event, literature regarding the effectiveness of cap and trade versus emissions taxes or conventional pollution regulation is voluminous, [26] and this Article will not attempt to address it.

The stakeholders in the design of an environmental trading system have varying interests and viewpoints. Such differences are not surprising in a stakeholder group that includes consumer advocates, environmental groups, environmental justice advocates, industry, and government agencies. It may be impossible to reach a consensus on system design, but many conflicting concerns can reasonably be addressed without impairing environmental goals.

I will discuss three aspects of distributional fairness related to cap and trade: fairness in the distribution of emissions allowances to businesses, fairness in the distribution of target and co-pollutant emissions among different segments of society, and fairness in the relative financial impact of the cap-and-trade system on low-income consumers of energy and energy-intensive products.[27]

In order to provide some concrete context for this analysis, Part I presents an overview of existing cap-and-trade systems and the experience we have accumulated regarding their design and operation since the first program began in 1990. While cap-and-trade systems have had varying degrees of success, more important for our purposes is examining how program design relates to fairness.

Part II analyzes fairness in the distribution of emissions allowances to existing businesses under a cap-and-trade system. If allowances are distributed free of charge, businesses may advocate particular allocation criteria—such as distributing allowances based on historic emissions or on energy input—on the basis of fairness. If, instead, allowances are auctioned, businesses will likely argue that it is unfair to require them to pay for lawful emissions when they have made past investments based on reliance on the legality of those

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trade program is ineffective in reducing the targeted pollutant, this is obviously a problem in terms of effectiveness, and is also a concern for equity advocates to the extent that the status quo distribution of the targeted pollutant is considered unfair.

26. For a sampling of the literature, see, e.g., Reuvan S. Avi-Yuonah & David M. Uhlmann, *Combatting Global Climate Change: Why a Carbon Tax Is a Better Response to Global Warming Than Cap and Trade*, 28 STAN. ENVTL. L.J. 3 (2009); Robert N. Stavins, *A Meaningful U.S. Cap-and-Trade System to Address Climate Change*, 32 HARV. ENVTL. L. REV. 293 (2008); Hahn & Hester, *supra* note 2.

27. This third issue has not yet attracted much attention by environmental justice advocates, as David Super observes:

> Higher prices are a necessary but negative consequence of carbon-emissions regulation, and they will consume a disproportionate share of low-income people's resources. That negative exposure thus would seem to make this an issue of environmental justice. To date, however, the environmental justice movement has remained largely silent. Instead, it has continued to focus on geographically distinct communities, rather than on people of color and low-income people generally.

David A. Super, *From the Greenhouse to the Poorhouse: Carbon-Emissions Control and the Rules of Legislative Joinder*, 158 U. PA. L. REV. 1093, 1150 (2010).

emissions.[28] However, I present arguments against the large-scale free distribution of allowances to industry. I conclude that we can compensate businesses (to the extent we want to do so) with relatively small allocations of free allowances, while auctioning the rest of the allowances.

Part III considers the fairness implications of cap and trade for hot spots of the traded pollutant and accompanying co-pollutants in disadvantaged communities. This is a major concern of environmental justice advocates.[29] Local pollution concentrations are broadly relevant to environmental policy because of their potential negative impact on public health and welfare. However, special concerns arise when a disproportionate pollution burden falls on communities that are already economically disadvantaged or subject to racial discrimination. The possibility of hot spots—or at least of a failure to reduce concentrations in all communities proportionately—cannot be dismissed, as it is impossible to perfectly predict the operation of any market, whether for pollution allowances or otherwise. On the other hand, recent empirical evidence suggests that emissions-trading systems have not performed badly when measured by fairness to disadvantaged communities, which have generally experienced significant reductions in pollution levels.

Part IV then considers fairness to low-income energy consumers—an issue that has received considerable attention from economists. Any method of reducing greenhouse gas emissions is likely to increase energy prices as producers pass emissions-reduction costs on to consumers, which will have a regressive effect because energy and energy-intensive products make up a larger percentage of the budget for low-income households. However, the regressive effects of an emissions trading system can be ameliorated through several mechanisms, such as allocating auction revenues to expansion of the earned-income credit.[30]

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28. These disputes are important not only for businesses but for consumers who may ultimately bear the costs of allowances in the form of higher prices. *See* discussion *infra* Part IV. Because business costs may be passed along to consumers, different allowance allocation methods may affect groups of consumers differently on the basis of geography or other factors. *See* discussion *infra* Part IV.

29. Concerns of environmental justice advocates regarding cap and trade are discussed in Lily N. Chinn, *Can the Market Be Fair and Efficient? An Environmental Justice Critique of Emissions Trading*, 26 ECOLOGY L.Q. 80 (1999); J. Andrew Hoerner & Nia Robinson, *A Climate of Change; African Americans, Global Warming, and Just Climate Policy for the U.S.*, ENVTL. JUSTICE AND CLIMATE CHANGE INITIATIVE (July 2008), *available at* http://urbanhabitat.org/files/climateofchange-2.pdf; Noga Morag-Levine, *The Problem of Pollution Hotspots: Pollution Markets, Coase, and Common Law*, 17 CORNELL J. L. & PUB. POL'Y 161 (2007); Seth B. Shonkoff et al., *Minding the Climate Gap: Environmental Health and Equity Implications of Climate Change Mitigation Policies in California*, 2 ENVTL. JUST. 173 (2009).

30. *See generally* ECON. AND ALLOCATION ADVISORY COMM., ALLOCATING EMISSIONS ALLOWANCES UNDER A CALIFORNIA CAP-AND-TRADE PROGRAM: RECOMMENDATIONS TO THE CALIFORNIA AIR RESOURCES BOARD AND CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY (2010), *available at* http://www.climatechange.ca.gov/eaac/documents/eaac_reports/2010-03-22_EAAC_Allocation_Report_Final.pdf (providing background information on emissions allocations and consumer equity issues).

A few words about terminology are in order before we begin. The terms "emissions trading" and "cap and trade" will be used interchangeably throughout this Article. "Pollutant" includes any harmful emission, including carbon dioxide (CO_2); a "regulated pollutant" or "target pollutant" is the pollutant that is subject to the cap-and-trade system. Emitters will be referred to interchangeably as "sources," "businesses," "plants," or "firms." Mobile emissions sources, such as automobiles, will not be included in this discussion because they have generally been covered by other forms of regulation; instead sources are assumed to be stationary. The term "hot spot" will be used to refer to high local concentrations of the regulated pollutant or co-pollutants emitted along with the regulated pollutant. In the interest of providing a concrete example to anchor the analysis, where the discussion is not specific about the nature of the pollutant or the source, it may be helpful for the reader to envision an electric power plant burning a fossil fuel, such as coal or natural gas, that emits CO_2 and its associated co-pollutants.

I. EXISTING CAP-AND-TRADE SYSTEMS

In this Part, I discuss the operation and structure of some actual cap-and-trade programs. Part I.A looks at the Acid Rain Program in the United States. This was the first major implementation of cap and trade, and it remains a lodestar for advocates of this approach. Part I.B discusses another effort to use cap and trade to control conventional pollutants: the Regional Clean Air Incentives Market (RECLAIM) in Southern California. As we will see, the performance of this program was less of a success story than the Acid Rain Program and illustrates the importance of system design. Part I.C evaluates the use of cap and trade as an option to control greenhouse gases by American states and the European Union. Given the importance of climate change as an environmental and societal issue, this use of cap and trade deserves careful attention.

Examining these programs provides context for the subsequent equity analyses while highlighting a number of ongoing controversies. For example, the Acid Rain Program provides a different perspective on the merits of cap and trade than RECLAIM provides. Similarly, the experience to date with using cap and trade to reduce greenhouse gas emissions can be seen either as a demonstration of the political feasibility of this approach and its practical potential, or as a sign that it fails to provide serious emissions reductions. Much is in the eye of the beholder. Readers who are predisposed to favor cap and trade, like many economists, may draw one set of lessons from this review, while other lessons may appeal to environmental justice advocates and environmentalists who find cap and trade suspect.

A. The Acid Rain Program

The U.S. Acid Rain Program was the world's first significant emissions trading system. Under the Reagan Administration, acid rain became a highly controversial and heavily politicized issue.[31] The Administration opposed congressionally proposed control programs and refused to take action in cooperation with the Canadians on the problem.[32] The political deadlock was broken during the first Bush Administration with the passage of the 1990 amendments to the Clean Air Act.[33]

With these amendments, Congress entirely bypassed the existing mechanism for resolving interstate disputes and established a new nationwide system to reduce sulfur-dioxide (SO_2) emissions.[34] It created a cap-and-trade system for addressing SO_2 emissions, setting the absolute nationwide ceiling (the "cap") on emissions from electric utilities at 8.9 million tons per year—an estimated 10 million tons below 1980 levels.[35] Congress left the mechanisms for achieving reductions unspecified, allowing individual firms to determine the most appropriate compliance pathway, such as energy conservation, the use of cleaner fuels, installation of pollution control technology, or purchase of additional allowances. Congress authorized the Environmental Protection Agency (EPA) to distribute allowances annually through a combination of mechanisms, including auctions and free allocation to firms.[36] Allowances can be transferred (bought and sold) beneath the cap.[37] Therefore, firms that are able to reduce their emissions may sell excess allowances, creating an incentive to develop and implement better emissions-control technologies.

The SO_2 trading program was divided into two phases. In Phase I, extending from 1995 to 1999 and covering a minority of the nation's steam-electric generating units, 111 plants (listed in the statute by name) received allowances for 2.5 pounds of sulfur dioxide per million British Thermal Units (lbs SO_2/mmBTUs) of energy input and could emit more only if they obtained additional allowances to do so.[38] Phase II, which began in 2000 and applies to

31. *See, e.g.*, Michael T. Kaufman, *Canada Announces New Effort to Cut Acid Rain*, N.Y. TIMES, Mar. 8, 1984, at A6 (describing the Reagan administration as "stalling by insisting on further study and research of the problem of acid rain, which many scientists say is killing life in lakes of Canada and parts of the northeastern United States").

32. *Id.*

33. The acid rain provision now constitutes Subchapter IV-a of the Clean Air Act, 42 U.S.C. §§ 7651–7651O (2006).

34. The existing interstate provisions were §§ 7410(a)(1)(D)(i) and 7426.

35. § 7651b(a)(1).

36. *See id.*

37. *See id.* § 7651b(b).

38. *See* 42 U.S.C. § 7651c(a) (2006); *see also* § 7651c tbl.A (allocating allowances on a plant by plant basis). EPA summarizes Phase I as follows:

> Phase I included certain electricity generating units. EPA allocated allowances at an emission rate of 2.5 pounds of SO_2/mmBtu (million British thermal units) of heat input, multiplied by the unit's baseline mmBtu (the average fossil fuel consumed from 1985 through 1987). These allowance allocations are listed in Table A of the Clean Air Act and codified in the

virtually all steam-electric utility units in the country, tightened the cap.[39] Large, poorly controlled plants receive base allowances of 1.2 tons SO_2/mmBTUs of energy input,[40] while a complex formula applies to smaller plants.[41] As discussed later, the reasons behind these allocation decisions seem to have been as much political as anything else.

From the outset, this SO_2 trading program provoked considerable scholarly discussion and controversy about program costs, cost savings, and its environmental and public health benefits.[42] The early history of the Acid Rain Program produced mixed results. For example, trading between companies was initially limited by public utility rules and flaws in implementation, which did not prevent more common use of intracompany trading.[43] Trading later expanded, and by March, 2002, at the Chicago Board of Trade's annual auction of SO_2 emissions allowances on behalf of the EPA, the average purchase price for each of the 125,000 then-usable allowances was approximately $167 each, indicating that the quantity of allowances was sufficiently restrictive to give individual allowances significant market value.[44] However, the program's performance has continued to be somewhat uneven. In 2003, there was a four percent rise in SO_2 emissions over the previous year,[45] and in 2004, allowance price jumped, likely due to increasing oil prices and expectations of tougher air pollution regulations on the horizon.[46]

> Allowance System Regulations . . . . Alternative or additional allowance allocations were made for various units, including affected units in Illinois, Indiana, and Ohio, which were allocated a pro rata share of 200,000 additional allowances each year from 1995 to 1999.

Acid Rain Program SO_2 Allowances Fact Sheet, U.S. EPA, http://www.epa.gov/airmarkets/trading/factsheet.html#how (last updated Apr. 14, 2009) [hereinafter *Allowances Fact Sheet*].

39. *See* § 7651d(b)–(f).

40. *See id.* §§ 7651d(b)(1), (c)(1)–(2).

41. *See id.* §§ 7651d(d)(1)–(2), (e), (f)(1). EPA summarizes Phase II as follows:

> EPA expanded the group of affected sources to include virtually all units over 25 MW in generating capacity, and tightened the allowance allocation. . . . EPA allocated allowances to each unit at an emission rate of 1.2 pounds of SO_2/mmBtu of heat input, multiplied by the unit's baseline. Beginning in 2010, the Act places a cap at 8.95 million on the number of allowances issued to units each year.

Allowances Fact Sheet, *supra* note 38.

42. *See generally, e.g.*, Byron Swift, *How Environmental Laws Work: An Analysis of the Utility Sector's Response to Regulation of Nitrogen Oxides and Sulfur Dioxides Under the Clean Air Act*, 14 TUL. ENVTL. L.J. 309 (2001); David M. Driesen, *Does Emissions Trading Encourage Innovation?*, 33 Envtl. L. Rep. (Envtl. Law Inst.) 10,094 (2003); Curtis A. Moore, *The 1990 Clean Air Act Amendments: Failing the Acid Test*, 34 Envtl. L. Rep. (Envtl. Law Inst.) 10,366 (2004).

43. *See* Dallas Burtraw, *Trading Emissions to Clean the Air: Exchanges Few but Savings Many*, RESOURCES, Winter 1996, at 3.

44. *See* Michael Bologna, *Emission Trading: Results of Sulfur Dioxide Auction Suggest Companies Anticipate Gentler Enforcement*, 33 Env't Rep. (BNA) 678 (2002).

45. *See EPA Report Shows Uptick in SO_2 in 2003, Amid 38% Decline in Emissions Since 1980*, ELEC. UTILITY WK., Sept. 27, 2004, at 6.

46. *See* Jacob Kreutzer, *Cap and Trade: A Behavioral Analysis of the Sulfur Dioxide Emissions Market*, 62 N.Y.U. ANN. SURV. AM. L. 125, 142–43 (2006). Kreutzer explains that

Nevertheless, the general verdict is that the Acid Rain Program has been successful in reducing emissions at a low cost.[47] A 2011 data review suggests that SO_2 allowances have been much cheaper than originally expected because industry found less expensive ways to reduce emissions, saving up to one billion dollars per year in compliance costs.[48] Price increases for consumers have presumably also been less than expected. To some extent, the program benefitted from fortuitous changes in fossil fuel prices in favor of lower-sulfur coal and natural gas.[49] Analytical efforts that attempt to control for these changes report "savings of 43–55 percent compared to a uniform standard that would have regulated the rate of emissions at a facility" and savings of twice that amount as compared with "a mandate to use postcombustion controls" such as scrubbers.[50] On the other hand, although the program does not appear to have generally led to increased SO_2 emissions in communities with large

> [t]he price of an emission allowance on April 1, 2004 was $272. By June 2nd the price was $375, and by July 1st the price was $425. . . . Two factors stand out as contributing to this change in price. First, increases in oil prices make coal power more attractive. When investors see or fear rising oil prices, they would become much less willing to part with emissions allowances. The other factor affecting the price of emissions allowances springs from a rule proposed by the EPA in January of 2004.

Id.

47. *See, e.g.*, U.S. ENVTL. PROT. AGENCY, ACID RAIN PROGRAM 2009 PROGRESS REPORTS, *available at* http://www.epa.gov/airmarkets/progress/ARP09.html; Steve Cochran, *Debunking Clean Air Scare Tactics: Part One, Acid Rain*, CLIMATE 411 (Dec. 2, 2010), http://blogs.edf.org/climate411/2010/12/02/there-they-go-again/; *see also* Hahn & Hester, *supra* note 2. Sovacool summarizes the program's accomplishments:

> [F]rom 1990 to 2006 most areas of the northwestern and Midwestern United States saw wet sulfate deposition, the major component of acid rain, decline by 25–40 percent and annual ecological and health benefits from the Acid Rain Program's emission reductions are estimated at $142 billion including the avoidance of nearly 19,000 premature deaths by 2010 (with annual compliance costs of only $3.5 billion).

Sovacool, *supra* note 22, at 577.

48. *See* WILLIAM C. WHITESELL, CLIMATE POLICY FOUNDATIONS 165–66 (2011). Sovacool argued that

> perhaps the most innovative component of the Acid Rain Program was the flexibility it gave facilities in determining compliance. Some operators worked with railroads shipping low-sulfur coal to reduce transportation costs, others adapted boilers with flue desulfurization equipment, still others experimented in fuel blending. Suppliers of high-sulfur coal started bundling allowances with coal to compensate buyers for the higher emissions and improve the competitiveness of their product, also enabling arbitrage between fuels and allowance markets. Other plants switched to cleaner fuels all together, retired and closed uneconomic facilities, and purchased allowances from the market.

Sovacool, *supra* note 22, at 577.

49. *See* Dallas Burtraw & Sarah Jo Szambelan, *U.S. Emissions Trading Markets for SO_2 and NO_X* 11 (Res. for the Future, Discussion Paper 09-40, 2009), *available at* http://www.rff.org/documents/RFF-DP-09-40.pdf.

50. *Id.* (emphasizing the findings of "the two most convincing studies," which used different analytical methods to arrive at similar conclusions).

minority populations, it has unfortunately contributed to increased emissions in some "poorly educated communities."[51]

From the perspective of advocates of cap and trade (though not necessarily environmental justice advocates), the Acid Rain Program is an encouraging example. But as we will see, implementation of cap-and-trade systems can sometimes have more troubled histories.

B. The RECLAIM Program

Another major experiment with cap and trade took place in Los Angeles: RECLAIM, Southern California's nitrogen oxides (NO_X) and SO_2 trading program.[52] In 1993, California's South Coast Air Quality Management District established a cap-and-trade program under which stationary sources like oil refineries received initial allowances of RECLAIM Trading Credits (RTCs) that they could either utilize or sell to other facilities.[53] The market contained 390 facilities, accounting for two-thirds of the NO_X emissions in the district.[54] The district set initial allocation of allowances based on maximum emissions during the 1989–92 period, with an adjustment to control for the total emissions from all sources.[55] The amount of pollution represented by an allowance would decline over time to lead to a reduction in total emissions across the district.[56]

51. *See* Evan J. Ringquist, *Trading Equity for Efficiency in Environmental Protection? Environmental Justice Effects from the SO_2 Allowance Trading Program*, 92 SOC. SCI. Q. 297, 297, 320 fig.5 (2011) (finding that "communities with high percentages of black and Hispanic residents experience fewer imports of sulfur dioxide" although "[a]llowance trading does transfer SO_2 emissions into poorly educated communities"); *see also* Jason Coburn, *Emissions Trading and Environmental Justice: Distributive Justice and the USA's Acid Rain Programme*, 28 ENVTL. CONSERVATION 323, 323 (2001) (finding that "[f]or the first few years of the ARP, the emissions trading regime does not appear to have been concentrating SO_2 pollution disproportionately for the poor and racial minority populations").

52. For a detailed description of the RECLAIM program, see generally Daniel P. Selmi, *Transforming Economic Incentives from Theory to Reality: The Marketable Permit Program of the South Coast Air Quality Management District*, 24 Envtl. L. Rep. (Envtl. Law Inst.) 10,695 (1994).

53. Selmi explains that the agency turned to cap and trade after political resistance to command-and-control regulations became severe:

> To implement the AQMP, a document that received widespread press coverage, the District embarked on an extensive series of rulemakings designed to regulate a large number of air pollution sources. Over a period of time, however, resistance gradually built to those efforts, with objections centering on the cost of air pollution controls in the air basin and on the allegation that the District's regulations were deterring businesses from locating or expanding in southern California. Responding to the difficulties it faced in further implementing the command-and-control rules called for by the plan, the District began a lengthy consideration of whether an economic incentive system might accomplish the same air quality goals while reducing both the costs and the level of government interference necessary to achieve those goals.

Id. at 10,696–97. Note that further progress using cap-and-trade may not have been a feasible alternative.

54. *Id.* at 10,698.

55. *Id.* at 10,698–99.

56. *See id.* at 10,699–701.

RECLAIM has produced a mixed record.[57] An overall assessment of the program by EPA staff observed that "[e]missions have been reduced under RECLAIM, but the program has also been criticized for delaying reductions, over-managing the market, and perpetuating complexity and uncertainty."[58] Design flaws plagued the program.[59] After initial overallocation of permits provided no real incentive to install control technologies, the district implemented changes that required "more reductions to meet tougher air quality goals." [60]

For example, the California electricity crisis in 2000 caused a price spike that dramatically affected the market for allowances and resulted in removal of the power sector from the NO_X market.[61] When electricity wholesale prices spiked at a time of high consumer demand, firms ramped up the capacity utilization of "local power plants without additional emissions controls—including older, higher-emitting peaking units" and "turned to the RTC market to cover their higher emissions, thus rapidly depleting the available supply of RTCs and driving prices up."[62] In response to this crisis, the South Coast Air Quality Management District made extensive changes to the system.[63]

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57. Criticisms of the program are presented in Drury et al., *supra* note 4.

58. EPA CLEAN AIR MKTS. DIV., AN OVERVIEW OF THE REGIONAL CLEAN AIR INCENTIVES MARKET (RECLAIM) 1 (2006), *available at* http://www.epa.gov/airmarkt/resource/docs/reclaimoverview.pdf [hereinafter RECLAIM OVERVIEW].

59. According to Sovacool:

> [R]egulators designed RECLAIM in a manner that exempted small new sources from having to purchase credits. Nearly 90 percent of credits went to petroleum processors and electric utilities, creating serious asymmetries between buyers and sellers. Source-specific limits on pollution were not avoided by trading when trading partners could not be found. A "contemporaneous requirement" meant that credits expired if they were not used, and distant trades were disincentivized by penalties. Firms . . . located in environmentally sensitive areas were required to buy more than one credit for every additional unit they emitted, in essence creating a geographically segmented market. The politics of setting up the system also resulted in an over allocation of permits in the early years, meaning the quantity of allowances issued exceeded the cap by as much as 37 percent. Further weakening the program was the fact that firms were able to self-select their base year, meaning that many overestimated their emission rates in order to get additional credits.

Sovacool, *supra* note 22, at 578.

60. *See* RECLAIM OVERVIEW, *supra* note 58, at 1, 22.

61. *See id.* at 8–9.

62. *Id.* at 6.

63. The changes included

> remov[ing] power generators from market and required emission controls. Power generating facilities greater than 50 MW were removed from the RECLAIM trading universe for 2001–2003 and required to install Best Available Retrofit Control Technology (BARCT) controls by the end of 2003. Though still required to comply with the program, power plants could no longer purchase NOx RTCs to offset emissions. . . . The power sector could not re-enter the market until and unless there was evidence that no negative impact on the rest of the program or the state's energy security would result. The AQMD would re-evaluate the market in 2004.
>
> Requir[ing] large sources to submit compliance plans. Facilities emitting over 50 tons annually must submit compliance plans specifying their approach (via an enforceable

Ultimately, despite problems, the program contributed to a 60 percent decrease in NO_X emissions from RECLAIM sources between 1994 and 2004.[64]

C. *Emissions Trading of Greenhouse Gases*

The next step in the development of emissions trading was to extend the use of trading programs to greenhouse gases.

After prior consideration of a carbon tax, in January 2005 the European Union began operating the world's first mandatory CO_2 emissions trading scheme.[65] For internal political reasons, the European Union differentially distributed "its internationally agreed target" obligations among member countries, ranging from "cuts of 28 percent (Luxembourg) to an allowed increase of 27 percent (Portugal)" relative to a 1990 baseline period.[66] E.U. member states then established their own trading programs, using a variety of schemes to allocate permits to their industries.[67] The program got off to a rocky start,[68] with disputes arising over, for example, allocations of emissions

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> commitment) for complying with NOx allocations . . . . Smaller sources (25 to 50 tons) were required to submit informational reports projecting compliance for 2002 through 2005.
>
> Improv[ing] RTC trade registration information. The AQMD adopted changes, including requirements for timely registration of trades, to provide more accurate and timely market information to participants.
>
> Add[ing] new mobile and area source credit generating rules. The amendments included additional credit rules to provide more opportunities to generate RTCs, such as replacing diesel-fired heavy-duty vehicles with clean technologies and pilot credit generation programs for marine vessels, hotelling operations, truck/trailer refrigeration units and agricultural pumps.

Id. at 9–10.

64. *Id.* at 12. A recent statistical study of program data determined that pollution reductions were greater for plants within the RECLAIM system than in similar California plants outside the system (not subject to cap and trade):

> Our empirical results indicate that emissions reported by facilities in the RECLAIM program fell by significantly more over the fifteen year study period (i.e., 1990–2005) as compared to emissions reported by a group of California facilities located in non-attainment counties, operating in the same industries, with similar pre-RECLAIM emissions levels. When we narrow our focus to the window of time surrounding the cross-over point (i.e., the point at which the aggregate cap began to bind), we continue to find that emissions reductions among RECLAIM firms are significantly greater on average as compared to the matched controls.

Meredith Fowlie et al., *What Do Emissions Markets Deliver and to Whom? Evidence from Southern California's NO_X Trading Program*, 102 AM. ECON. REV. (forthcoming 2012), *available at* http://www.ucei.berkeley.edu/PDF/csemwp186.pdf. More equity issues are discussed *infra* notes 146–149 and accompanying text.

65. Matthew Saltmarsh, *Market for Emissions Picks up Steam as Kyoto Protocol Takes Hold*, INT'L HERALD TRIB., July 6, 2005, at 19.

66. Richard N. Cooper, *Europe's Emissions Trading System* (Harvard Project on Int'l Climate Agreements, Discussion Paper 2010-40, Aug. 2010) (manuscript at 2), *available at* http://belfercenter.ksg.harvard.edu/files/CooperETSfinal.pdf.

67. *See id.* at 2–5.

68. Sovacool explains some of the design flaws in the program:

> Although the scheme covers more than ten thousand fossil fueled power plants, oil refineries, coke ovens, iron and steel plants, and factories producing cement, glass, lime, brick,

among countries and the overall cap on CO_2, which many argue was set too high (as was also true in the RECLAIM program).[69] A third phase, with more ambitious targets and greater use of auctioning, is planned for 2013–21.[70] However, due at least in part to overly generous cap setting, allowance distribution, and offsetting rules, to date the E.U. trading system does not appear to have experienced great success in reducing emissions.[71]

Although greenhouse gas emissions trading has yet to develop on a national level in the United States, a group of Northeastern and Mid-Atlantic states have agreed to a carbon cap-and-trade system among electrical power plants—the Regional Greenhouse Gas Initiative.[72] Seven states signed a memorandum of understanding in December 2005, committing to a detailed trading program.[73] Currently, ten states participate, and the fourteenth auction of allowances has just taken place.[74] As I will discuss in Part III.B, California is also en route to imposing a large-scale trading scheme.

D. *Issues Common to Existing Cap-and-Trade Systems*

Many of the details of these systems and their results are not crucial for the purposes of this Article because they relate more directly to effectiveness

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> ceramics, pulp and paper, it encompasses only carbon dioxide and not other potent greenhouse gases. Emissions credits were distributed for free as a rough function of past emissions, yet such a concession provided firms an incentive to emit more during the early years of the program in order to receive a larger future allocation. Furthermore, national governments let firms determine their own baselines and set their own abatement cost curves, with most firms electing to revise their estimates upward to obtain more generous allowances. Finally, regulators compromised on a five-year commitment period therefore providing little incentive for long term low-carbon investments (such as buildings or power plants) spanning more than the five-year window. These compromises greatly reduced the efficacy of the program. During the first phase of distributing allowances, the largest emitters were granted more rights to emit than they needed to cover their actual emissions.

Sovacool, *supra* note 22, at 581.

69. *See* David Gow, *UK Victory Rips Hole in EU's Pollution Trading Scheme*, GUARDIAN (London), Nov. 24, 2005, at 25. Allowance prices have fluctuated from as little as one euro to as much as thirty. The low initial price resulted from an overallocation of allowances. *See* Lesley McAllister, *The Overallocation Problem in Cap-and-Trade: Moving Toward Stringency*, 34 COLUM. J. ENVTL. L. 395, 408–11 (2009); Kurkowski, *supra* note 22, at 711–22. For more information on the E.U. system, see A. DENNY ELLEERMAN & PAUL L. JOSKOW, THE EUROPEAN UNION'S EMISSIONS TRADING SYSTEM IN PERSPECTIVE 32 (2008), *available at* http://www.c2es.org/docUploads/EU-ETS-In-Perspective-Report.pdf.

70. *See* Cooper, *supra* note 66, at 13–15. During this phase, the E.U. will also "deliberately favor its poorer members with permits in excess of what would be allocated to them under normal guidance." *Id.* at 15.

71. *See id.* at 21–22; Ben Schiller, *Europe's CO_2 Trading Scheme: Is It Time for a Major Overhaul?*, YALE ENV'T 360 (Apr. 28, 2011), http://e360.yale.edu/feature/europes_co2_trading_scheme_is_it_time_for_a_major_overhaul/2396/.

72. *See* REGIONAL GREENHOUSE GAS INITIATIVE, http://www.rggi.org (last visited Jan. 23, 2012) [hereinafter RGGI WEBSITE].

73. *See generally* Regional Greenhouse Gas Initiative: Memorandum of Understanding (Dec. 20, 2005), *available at* http://www.rggi.org/docs/mou_12_20_05.pdf.

74. See RGGI WEBSITE, *supra* note 72.

than to equity. It would take a book to fully evaluate their design and operation, and much of the book would concern cost and effectiveness in reducing total emissions rather than proportionality between affected communities. However, there are some lessons to be learned that are relevant for present purposes.

One observation common to all the examples given above is that implementing an effective cap-and-trade scheme is not a simple matter.[75] Most of the programs experienced slow starts in trading, initial overallocation of permits, or other significant problems. Midcourse corrections are often needed. While the principle of emissions trading is clear and elegant, implementation involves a host of technical details that are critical to successful operation of the system.

One issue is that the theory behind cap and trade is well established, but there is still a great deal we do not understand about how emissions trading systems actually operate. As the authors of a 2007 review concluded, "Though we have some evidence of significant cost savings through emissions trading schemes, we know much less about how effective (in terms of measurable environmental benefits) and fair (in terms of distributional burdens) they are."[76] They further noted that "[t]he studies that do exist are laudable and informative, yet their methodological limitations caution against strong conclusions."[77] As we will see in the remainder of this Article, recent research has addressed some of these gaps, but there is still much we do not know.

When analyzing the overall case for cap and trade versus alternative methods of emissions reductions, these uncertainties about implementation are cause for concern. On the other hand, alternative methods of controlling emissions have their own difficulties. Although a carbon tax is an attractive

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75. Based on case studies of several systems, Sovacool has argued that certain defects are intrinsic to cap and trade:

> [P]olitics constrains the efficacy of tradable permit mechanisms, placing pressures on them to bring benefits to stakeholders in the present (at the expense of future generations) and to particular regions and sectors (at the expense of others). Human behavior in tradable permit markets is unpredictable; a sort of wild card that can distort even the most rigorously designed schemes. Firms and individuals often find ways to use or manipulate tradable credit markets to accrue benefits to them. In some cases traders refrain from participation due to distrust of the market mechanism or significant volatility in credit prices. In others compromises in design have weakened penalties for non-compliance (or excessively distributed allowances), reducing incentives to participate. In still others firms influence the design of a particular scheme so that it convey [sic] rents to them and acts as a powerful tool for impeding competition or raising revenue.

Sovacool, *supra* note 22, at 583. Note that Sovacool did not survey the environmental benefits achieved by cap and trade systems, only their flaws, nor did he provide comparisons to other regulatory approaches or indicate that other forms of regulation were politically feasible. *See id.* at 575, 583. However, it is hard to quarrel with the conclusion that "one should be wary about endorsing tradable permits as a panacea." *Id.* at 583.

76. Jody Freeman & Charles D. Kolstad, *Prescriptive Environmental Regulations Versus Market-Based Incentives*, *in* MOVING TO MARKETS IN ENVIRONMENTAL REGULATION 14–15 (Jody Freeman & Charles D. Kolstad eds., 2007).

77. *Id.* at 15.

theoretical concept, it has design and implementation issues of its own.[78] Similarly, while we have more experience with environmental command-and-control regulations, they can be very time-consuming and expensive to develop and implement.[79]

However, these issues of effectiveness are distinct from those pertaining to fairness. A cap-and-trade system might be effective in reducing greenhouse gas emissions, but its benefits and burdens could fall very unevenly on different groups. On the other hand, whether or not using cap and trade is more effective than alternative forms of regulation, it might be better (or worse) at equalizing the pollution burdens and benefits of regulation experienced by various segments of society.

The remainder of this Article explores the fairness issues relevant to emissions trading schemes, with primary attention given to potential cap-and-trade programs intended to control greenhouse gases. We begin with the question of how to allocate emissions allowances fairly to industry.

II. FAIRNESS TO INDUSTRY

The mechanism used to distribute emissions allowances is a key part of a cap-and-trade program. If it provides allowances to emitters free of charge, then, to actually regulate the quantity of emissions, the trading program requires a system for determining the specific allocation of permits to different sources. For instance, allocation could be based on plant output, so that power plants with the same generating capacity would receive the same number of allowances. Alternatively, allowances might be distributed on the basis of past emissions, so that sources with high past emissions would receive more allowances than less polluting sources. Another option is to auction emissions allowances to the highest bidders. A combined approach could involve distributing some allowances for free while auctioning the remainder.

Allowance distribution naturally involves fairness considerations for the regulated industry. Under an auction system, firms with high current emissions might argue that it is unfair to require them to purchase emissions allowances from the government or from other firms. They would assert that their shareholders invested in a company that was operating in complete compliance with the law but is being impacted by new government policies such that they ought to be "grandfathered in." The economic impact of the allowance system is not limited to shareholders. In the electrical power industry, this is not simply a question of fairness for utility shareholders. It is also a question of fairness to consumers, especially low-income consumers, who will have to pay higher

78. After all, the income tax is also an attractively simple concept, but its actual implementation has become complex and fraught with political controversy. *See, e.g.*, John Steele Gordon, *A Short History of the Income Tax*, WALL ST. J., Sept. 27, 2011, *available at* http://online.wsj.com/article/SB10001424052970204422404576594471646927038.html.

79. *See Houck*, *supra* note 11.

prices for electricity as a result of higher industry costs. The distribution among industry may have geographic implications, in effect favoring consumers in some areas of the country over consumers in other areas, or distribution effects, such as impacting low-income consumers compared to higher-income consumers. Conversely, others might argue that no one has a property right to using the atmosphere for disposing of pollutants—instead, the atmosphere belongs to the public. From this perspective, being allowed to emit is a privilege for which firms should have to compensate the public. This Part attempts to evaluate these and other fairness claims regarding allowance allocation.

A. *Distributing Free Allowances Based on Political Considerations or Baseline Pollution*

In the U.S. Acid Rain Program, allocations of emissions allowances appear to have been manipulated in the interests of regional equity and other political considerations. Recall that the program distributes allowances for free according to complicated provisions relating to individual power plants and their characteristics.[80] In essence, allocation occurs on a source-by-source basis, rather than on the basis of a single, uniform formula, and there are a variety of provisions that potentially provide emitters with additional allowances.[81]

This complicated scheme of distribution does not have a straightforward policy explanation. One observer found it "difficult to imagine what lies behind these special bonuses and exemptions [under the Act], other than the kind of special interest deal that proponents of emissions trading had hoped their system would preempt."[82] Indeed, some critics have surmised that legislators "saw little distinction between the Clean Air Act and a fight over which defense installation to close, or an appropriation for public works projects," concluding that "[t]he pork tastes as good, from whichever barrel it comes."[83]

While raw politics may certainly affect the distribution of emissions allowances across industries and even among individual sources, the political details behind these decisions are sometimes complex. For example, one economic study found that members of Congress from some coal-producing states pursued benefits for miners and sustained demand for high-sulfur coal under the Acid Rain Program by creating incentives for installing SO_2 scrubbers rather than trying to obtain additional allowances.[84] Additionally,

80. *See* discussion *supra* Part I.A.

81. *See* discussion *supra* Part I.A.

82. Lisa Heinzerling, *Selling Pollution, Forcing Democracy*, 14 STAN. ENVTL. L.J. 300, 330 (1995).

83. *Id.*

84. *See* Paul L. Joskow & Richard Schmalensee, *The Political Economy of Market-Based Environmental Policy: The U.S. Acid Rain Program*, 41 J.L. & ECON. 37 (1998) (statistical study of voting patterns finding only limited influence by "special interests").

representatives of some states that used high-sulfur coal accepted higher allowance allocations in earlier years in exchange for lower allocations in later years, rather than receiving higher total allocations.[85] Therefore, although these local interests did influence the process, the overall result may have been relatively benign in that they merely changed the form of or postponed, rather than diminished, overall pollution reductions. Unfortunately, the absence of recorded votes on allowance distribution makes it hard to tease out more specific political coalitions.[86]

The potentially political nature of the allocation process can be seen as either a positive or a negative. Considered in isolation, the politicization of allowance allocation does not seem to make for good public policy, since political influence—rather than principled analysis of what is required to protect public health and welfare—determines the outcome. However, the potential for using the allocation process to further local or regional political goals could prove to be a politically valuable tool for proponents of reduced emissions in overcoming legislative political opposition to emissions regulation. The ability to assuage antiregulatory interests through the allowance process is a feature inherent in cap and trade (when at least a portion of allowances are free rather than auctioned), as opposed to emissions taxes or conventional regulation.

It is tempting to try to neutralize complaints about the negative economic impacts of an emissions trading scheme by awarding allowances based on current or past pollution levels—in effect, "grandfathering" current emitters into the program by giving larger emitters more allowances—but we should not do so reflexively. Economists report that grandfathering can protect stock prices in the fossil fuel industry and firms that rely on fossil fuels.[87] Yet they contend that this can also be accomplished by providing only a small portion of allowances for free, because companies also benefit from the higher consumer prices that result from regulation.[88] Thus, fairness to industry provides at most an argument for small-scale distribution of free allowances, rather than for avoiding allowance auctioning entirely.

Environmental scholars and economists are generally critical of grandfathering existing pollution sources. A recent review of the literature concluded that "[m]ost of those economists and policy analysts who have examined the practice [of grandfathering, also called "transition relief,"] have concluded that in many circumstances, relief undermines the goals of policy

85. *See id.*

86. *Id.* at 67.

87. *See* A. Lars Bovenberg & Lawrence H. Goulder, *Neutralizing the Adverse Industry Impacts of CO_2 Abatement Policies: What Does It Cost?*, *in* BEHAVIORAL AND DISTRIBUTIONAL EFFECTS OF ENVIRONMENTAL POLICY 45 (Carlo Carraro & Gilbert E. Metcalf eds., 2000).

88. *See id.* at 79.

change."[89] In the words of one economist: "[G]randfathering is in the selfish interest of incumbents in an activity, especially of firms in an industry, and allows them to benefit without appearing to stand in the way of legal change."[90]

In response, advocates of free distribution of emissions allowances argue for recognizing an implicit property right to emit "on the grounds that firms have been given rights by the state to operate on the basis that they provide socially beneficial goods and services to society."[91] These firms produce valuable goods and services, such as the electricity needed for lighting and heating. Advocates of free allowances argue that, since emissions are an unavoidable byproduct of the production process, firms should not be charged for lawful emissions.[92] In other words, firms should not have to pay for emissions permits, regardless of whether or not the permits are marketable. From this vantage point, the alleged unfairness is not the fact that firms must incur expenses in order to decrease emissions to the level required by law, but the fact that even after doing so, firms must pay a fee for their remaining lawful emissions. This is an interesting if somewhat counterintuitive argument, which

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89. Bruce R. Huber, *Transition Policy in Environmental Law*, 35 HARV. ENVTL. L. REV. 91, 110 (2011). Quite apart from industry equity concerns, putting a price on carbon in globally competitive, energy-intensive industries might result in leakage of emissions to countries without a carbon price. *See, e.g.*, Cristoph Bohringer, Carolyn Fischer & Knut Einar Rosendahl, *Cost-Effective Unilateral Climate Policy Design: Size Matters* 35 (Res. for the Future, Discussion Paper 11-34, 2011), *available at* http://www.rff.org/Publications/Pages/PublicationDetails.aspx?PublicationID=21608.

90. Steven Shavell, *On Optimal Legal Change, Past Behavior and Grandfathering*, 37 J. LEGAL STUD. 37, 82 (2008). As Jonathan Remy Nash observes:

> Traditional grandfathering-based systems make initial allocations of grandfathered rights—that is, the right to continue to engage in the behavior that will be restricted going forward—in accordance with a rule of first possession. The allocation of resource access in this way creates an incentive for societal actors to engage in a race to capture future resource access, on top of the then-existing race to capture the resource itself. Commentators have elucidated the tragedy of the commons nature of the race and have criticized it for creating incentives for competitors to expend inefficiently too much effort toward winning, and for causing inefficiently early distribution—and depletion—of the resource at issue.

Jonathan Remy Nash, *Allocation and Uncertainty: Strategic Responses to Environmental Grandfathering*, 36 ECOLOGY L.Q. 809, 811 (2009).

91. Gilbert Metcalf, *Paying for Greenhouse Gas Reductions: What Role for Fairness?*, 15 LEWIS & CLARK L. REV. 393, 397 (2011). Although he does not take a position on the validity of this argument, Metcalf argues that recognizing such a property right would not be inconsistent with imposing a cap on emissions:

> At first blush this appears to conflict with the economic prescription for efficiency that firms recognize the full costs of using resources in production. Those full costs include the climate change damages arising from greenhouse gas emissions. There is, in fact, no conflict at all. Tradable emission schemes have two key design elements. The first is the carbon price which is set by the intersection of demand for permits and the supply. The second is the means of allocating those permits. The carbon price ensures that firms internalize the external costs of climate change. As noted above, how the permits are allocated is entirely separate and can be determined through political negotiation or the reliance on some principal of property rights.

Id.

92. *Id.*

contrasts with the widely accepted idea that polluters should pay for the harm they cause society by internalizing the true costs of their activities even if they have not previously been required to do so. This argument would provide a basis for opposition to both cap-and-trade programs that auction allowances and emissions taxes.

B. *Distributing Allowances by Auction*

It is helpful to put to one side the argument for transition relief or grandfathering based on the claim that companies justifiably planned their investments assuming that they would not have to pay for emissions. In order to do so, we can ask whether a country that is just beginning industrialization and has established an emissions trading system preemptively (in the absence of incumbent emitters) should use free allocation or an auction to distribute emissions allowances. Apart from normative arguments for public ownership of the right to clean air, as opposed to recognizing private ownership of the right to pollute,[93] a practical argument arises in favor of auctioning. Understanding this argument requires a brief exploration of the effect of capping emissions on prices.

The basic point is that some firms will collect windfall profits due to generally rising energy prices if allowances are free.[94] Industry can meet an emissions cap in either of two ways or through a combination of the two. First, it can reduce output in order to achieve corresponding reductions in emissions. Reducing output creates scarcity, forcing buyers to bid up prices. Second, industry can use new technologies or switch to less emissions-intensive fuels to meet the cap. Because this raises production costs[95] and energy is a fungible commodity, industry-wide prices increase. Higher prices are charged for all output, including output from plants that do not use pricey new technologies or more expensive fuels. Therefore, whether industry meets the cap through output

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93. *See* PETER BARNES, WHO OWNS THE SKY? OUR COMMON ASSETS AND THE FUTURE OF CAPITALISM 53–59 (2001).

94. As a Congressional Budget Office analyst explains:

> If companies benefited from the [energy] price increases but did not have to purchase the allowances, they would receive windfall profits, which could be very large. For example, in 2000, CBO estimated that if emissions were reduced by 15 percent and all of the allowances were distributed free of charge to producers in the oil, natural gas, and coal sectors, the value of the allowances would be 10 times the combined profits of those producers in 1998. Thus, the windfall gains that they would receive as a result of the free allocation would far outweigh the loss in sales that they might experience as consumers cut back on their use of fossil fuels.

The Distributional Consequences of a Cap-and-Trade Program CO_2 Emissions: Hearing Before the Subcomm. on Income Security and Family Support of the H. Comm. On Ways and Means, 111th Cong. 9 (2009) (statement of Terry M. Dinan, Senior Advisor, Congressional Budget Office), *available at* http://www.cbo.gov/ftpdocs/100xx/doc10018/03-12-ClimateChange_Testimony.pdf [hereinafter *Dinan Testimony*].

95. If new technologies or production methods lowered costs, presumably companies would have adopted them without the compulsion of regulation.

reductions (compared with business as usual, in the absence of a cap), new technology, or fuel switching, the resulting system-wide electricity price increase raises profits for status-quo facilities.[96]

The preceding analysis applies to competitive, unregulated markets. Utility regulation may prevent firms from collecting windfall profits, but conventional rate regulation also mandates that firms be able to earn reasonable returns even if the cap-and-trade system imposes additional costs such as allowance costs.[97] Thus, the equity argument for free allowances fails for regulated utilities, although the windfall profit argument may not apply.

Although calculating the precise effect of a distribution scheme is complex and uncertain, giving allowances away for free is plainly regressive. On the other hand, auctioning allowances shifts the economic benefit of allowance value to the government (and, hence, to the taxpayers). Auctioning thus prevents the trading system from effectively granting emitters a property interest in a right to emit that results in long-term windfall profits for industry shareholders at the general public's expense.[98] It also allows the government to apply auction revenues to counter the regressive effects of the remaining energy price increases on low-income consumers.[99]

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96. As economists from Resources for the Future explain:

> The suggestion of free distribution through grandfathering to incumbent emitters without adjustment should be the most popular approach for industry because it awards an asset worth tens of billions of dollars. In the electricity sector, which is the focus of our study, such an approach would lead to substantial net profits (windfall profits) as a result of climate policy. This occurs because the increase in revenues associated with the increase in electricity price would greatly outweigh the increase in costs resulting from compliance with the program when emissions allowances are given away for free.

Dallas Burtraw, Margaret Walls & Joshua Blonz, *Distributional Impacts of Carbon Pricing Policies in the Electricity Sector* 8 (Res. for the Future, Discussion Paper 09-43, 2009), *available at* http://www.rff.org/documents/RFF-DP-09-43.pdf. The increase in revenues associated with the increase in electricity price would greatly outweigh the increase in costs resulting from compliance with the program when emissions allowances are given away for free. The price increases are significantly smaller in regulated markets (where state regulators control prices) than in competitive markets. *Id.* at 9.

97. For an introduction to utility rate regulation, see Robert J. Michaels, *Electricity and Its Regulation*, THE CONCISE ENCYCLOPEDIA OF ECONOMICS (2008), http://www.econlib.org/library/Enc/ElectricityandItsRegulation.html ("'Cost of service' regulation sets retail rates to recover expenses and give a "fair" return on capital."). The argument in the text regarding competitive markets applies, however, when utility markets have been deregulated and are no longer subject to "cost of service" regulation.

98. This is somewhat analogous to the difference between tariffs and import quotas in international trade. An import quota reduces supply of the product, which drives up prices, allowing producers to reap the same benefit as they would have if they had entered into a price-fixing agreement. Although a tariff can produce the same reduction in imports, the government, rather than producers themselves, collects the tariff.

99. For example, auction revenue can be used to decrease taxes. *See* Dallas Burtraw & W.H. Parry, *Options for Returning the Value of CO_2 Emissions Allowances to Households* (Res. for the Future, Discussion Paper 11-03, 2011), *available at* http://www.rff.org/documents/RFF-DP-11-03.pdf. Burtraw and Parry argue that efficiency strongly favors this option:

> A theme of our discussion is that these trade-offs can be quite stark. In particular, economic theory suggests that addressing ethical, distributional, and feasibility goals can imply

Despite this argument, free distribution has considerable political appeal because it reduces industry opposition to regulation. Yet, the commonly used method of basing free allowance allocation on historic emissions levels has obvious disadvantages. First, this choice of baseline penalizes with lower allowance allocations on par with their lower historic emissions levels emitters who invested in earlier emissions reductions, while rewarding laggards who did not invest in such technology. Second, it favors current emitters over new sources, which are often more efficient, emit less, and consequently may receive fewer allowances because their historic emissions are lower. The new sources may even have to purchase allowances from existing plants if they are built after the trading system goes into effect (since their baseline emissions are zero). Again, this results in a penalty to those that already emit less.

In the event a cap-and-trade program intends to base allowance allocation on historic baseline emissions, it is important to incorporate safeguards against "gaming" the system.[100] These include ensuring adequate data to establish an accurate baseline, selecting a baseline prior to proposal of the trading scheme (to avoid the temptation to increase emissions in order to achieve a higher baseline), adjusting past emissions based on currently available control technologies, and creating a clear standard for calculating the baseline amount.[101]

In sum, it seems better to auction emissions allowances to avoid these problems. Auctioning eliminates the need to devise a complicated allocation scheme, and it prevents firms from gaining windfall profits from the economic value of free allowances. At most, a relatively small share of allowances should

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> considerably higher overall program costs. In fact, using at least some of the revenue to execute a tax shift by lowering distortionary taxes may be needed to ensure that costs to the economy with cap-and-trade are lower than with other alternatives, including direct regulation.

Id. at 3. They contend that "[u]sing CO_2 revenue to reduce preexisting taxes would be an investment in economic efficiency that would be likely to have positive effects throughout the income distribution by promoting economic growth, even if the immediate beneficiaries of the tax reduction are not distributed evenly." *Id.* at 23.

100. *See* J.B. Ruhl & James Salzman, *Gaming the Past: The Theory and Practice of Historic Baselines in the Administrative State*, 64 VAND. L. REV. 1 (2011). As Ruhl and Salzman explain, while

> all standard-setting approaches are subject to gaming, [] the temporal component of historic baselines sets them apart from the other approaches and opens up qualitatively different strategic opportunities. While historic baselines may seem like innocuous, inert dates from the past, it turns out they are well suited for intense gaming in ways that favor particular political or economic interests, potentially diluting the effectiveness of the baseline while appearing to anchor and guide regulatory policy. Strategic framing of the unit of the baseline or the way in which success toward achieving the target is measured can infuse malleability into the baseline over the long term.

Id. at 8.

101. *Id.* at 28–44; *see also Nash*, *supra* note 90, at 811 (explaining the argument for using a retrospective baseline and pointing out that this approach is also susceptible to strategic behavior if firms learn to anticipate its use in future regulation).

be distributed free to firms in order to compensate their shareholders for the financial burden of reducing CO_2 emissions.[102]

III. FAIRNESS, HOT SPOTS, AND CO-POLLUTANTS

Power plants and motor vehicles are the major sources of a variety of air pollutants produced by burning fossil fuels.[103] Therefore, measures aimed at reducing CO_2 emissions, like a cap-and-trade program, may reduce the use of fossil fuels and have the salutary side effect of reducing co-pollutants from these sources.[104] There is controversy, however, over whether the benefits from this possible reduction would be spread fairly across different communities.[105] The debate is heightened because of concerns that existing pollutant emissions are themselves spread unevenly, with certain communities bearing the brunt of air pollution.[106]

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102. As one report explains:

> To create a level playing field, the government needs to freely allocate only a fraction of the permits. Based on [] model simulations . . . only about 13% of the permits must be freely distributed to the major affected industries in order to prevent losses of profit. The remainder of the permits can be auctioned, thus generating revenues to finance cuts in pre-existing distortionary taxes—thereby offsetting the adverse effects of the new CO2 policies.

Richard D. Morgenstern et al., *The Distributional Impacts of Carbon Mitigation Policies* 2 (Res. for the Future, Discussion Paper 02-03, 2002), *available at* http://www.rff.org/rff/Documents/RFF-IB-02-03.pdf.

103. *See, e.g.*, Alice Kaswan, *Decentralizing Cap-and-Trade? State Controls Within a Federal Greenhouse Gas Cap-and-Trade Program*, 28 VA. ENVTL. L.J. 343, 351 (2010) ("[C]arbon dioxide emissions are almost always accompanied by more hazardous co-pollutants. Particulates, sulfur oxides, nitrogen oxides, volatile organic compounds, benzene, and mercury are common co-pollutants.").

104. *See id.* ("Where low-cost emission reducers reduce significantly, the surrounding area could experience significant emission reductions of both GHGs and co-pollutants.").

105. *See* Eileen Gauna, *An Essay on Environmental Justice: The Past, the Present, and Back to the Future*, 42 NAT. RESOURCES J. 701 (2002) (providing a good summary of the equity concerns of environmental justice advocates).

106. *See* Mary B. Collins, *Risk-Based Targeting: Identifying Disproportionalities in the Sources and Effects of Industrial Pollution*, 101 AM. J. PUB. HEALTH S231, S231 (2011) ("Although methodological debates remain, most studies have supported the contention that racial and ethnic minorities and people of low socioeconomic status are disproportionately exposed to environmental hazards."); Paul Mohai, David Pellow & J. Timmons Roberts, *Environmental Justice*, 34 ANN. REV. ENV'T & RESOURCES 405, 405, 425 (2009) (reviewing "two decades of scholars' claims that exposures to pollution and other environmental risks are unequally distributed by race and class" and concluding that "[h]undreds of studies have now documented unequal exposures by race, ethnicity, and economic class"); *see also* Marie Lynn Miranda et al., *Making the Environmental Justice Grade: The Relative Burden of Air Pollution Exposure in the United States*, 8 INT'L J. ENVTL. & RES. PUB. HEALTH 1755, 1755 (2011) ("[W]ithin areas covered by [] monitoring networks, non-Hispanic blacks are consistently overrepresented in communities with the poorest air quality."); Sara Grineski, Bob Bolin & Christopher Boone, *Criteria Air Pollution and Marginalized Populations: Environmental Inequity in Metropolitan Phoenix, Arizona*, 88 SOC. SCI. Q. 535, 535 (2007) (finding "that Census block groups with lower neighborhood socioeconomic status, higher proportions of Latino immigrants, and higher proportions of renters are exposed to higher levels of criteria air pollutants" in the metropolitan Phoenix area); Rachel Morello-Frosch & Russ Lopez, *The Riskscape and the Color Line: Examining the Role of Segregation in Environmental Health Disparities*, 102 ENVTL. RES. 181, 186 (2006) (noting that low-resolution air quality monitoring of major metropolitan areas, although not detailed enough to allow analysis "of

Hot spots are areas of heavy, localized concentrations of a pollutant.[107] Because emissions trading does not augment or affect minimum local pollution standards in a way that could prevent hot spots, it is poorly suited to address unevenly distributed air pollutants that directly impact public health.[108] Conversely, cap and trade is an appropriate regulatory solution for persistent (and, therefore, well-mixed) pollutants that lack strongly localized negative health effects. In the latter situation, emissions trades between different sources will have little impact on local concentrations of the pollutant, minimizing distributive justice complaints. However, the target pollutant may be produced in conjunction with hot-spot-forming co-pollutants that may already be subjected to regulatory requirements—or which theoretically *could be* subjected to such requirements—outside of the cap-and-trade system. CO_2 is such an example. It is fairly well mixed in the atmosphere and lacks direct negative local impacts, characteristics that some of its co-pollutants do not share.[109] While target pollutant hot spots call into question whether cap and trade is a suitable method for regulating that pollutant, co-pollutant hot spots raise the question of whether to adjust (or abandon) the cap-and-trade approach,

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neighborhood level effects" reveals a correlation between "Black-White segregation . . . and increased metropolitan-wide levels of sulfur dioxide and ozone"); Manuel Pastor Jr., James L. Sadd & Rachel Morello-Frosch, *Waiting to Inhale: The Demographics of Toxic Air Release Facilities in 21st-Century California*, 85 SOC. SCI. Q. 420, 420 (2004) ("Analytical results suggest a pattern of disproportionate exposure [to toxic releases] based on race, with the disparity most severe for Latinos . . ."); Rachel Morello-Frosch et al., *Environmental Justice and Regional Inequality in Southern California: Implications for Future Research*, 110 ENVTL. HEALTH PERSP. 149, 149 (2002) (Study results "indicate that communities of color bear a disproportionate burden in the location of treatment, storage, and disposal facilities and Toxic Release Inventory facilities . . . [and] that facility siting in communities of color, not market-based 'minority move-in,' accounts for these disparities").

107. *Cap and Trade Frequent Questions*, U.S. EPA, http://www.epa.gov/captrade/faqs.html (last updated Apr. 09, 2009). Hot spots "may accumulate in small areas within the larger pollution control region. Some pollutants do not have significant site-specific impacts, but others create localized pollution problems around the emitting source." Bradford C. Mank, *What Comes After Technology: Using an "Exceptions Process" to Improve Residual Risk Regulation of Hazardous Air Pollutants*, 13 STAN. ENVTL. L.J. 263, 290 (1994).

108. One legal scholar notes that

> under technology standards, the hotspot is an artifact of feasible pollution control technology or locational clustering, while under emissions trading, varying levels of air quality are hardwired into the design of the regulatory instrument. Locally uncontrolled air pollution at a given location is a plausible outcome under emissions trading, in contrast to uniform standards, where, by definition, some control is required everywhere.

Morag-Levine, *supra* note 29, at 104.

109. Kaswan describes the distinction in the following way:

> Trading programs focus on achieving an aggregate goal cost-effectively, not on the distribution of emissions. That feature may appear irrelevant in the GHG context, as the most prevalent GHG from stationary sources, carbon dioxide, does not have local environmental consequences. However, carbon dioxide emissions are almost always accompanied by more hazardous co-pollutants. Particulates, sulfur oxides, nitrogen oxides, volatile organic compounds, benzene, and mercury are common co-pollutants.

Kaswan, *supra* note 103, at 351.

or to instead pursue hot spot amelioration separately and in addition to cap and trade by enacting regulations specifically targeted at co-pollutants.

A basic concern is the possibility that "[i]f facilities with high costs of control are located in [especially] polluted areas and rely upon allowance purchases rather than reducing emissions, air quality will not be improved" in these disproportionately burdened places.[110] Even if a trading system reduces co-pollutants across the board, disadvantaged communities will likely continue to bear a disproportionate share of the pollution burden and might not receive their fair share of co-pollutant reduction benefits.[111] Furthermore, if air pollution regulations are not strict enough, pollution in these communities could remain high or actually increase if local facilities are used more heavily.[112] For instance, plants in especially polluted communities might increase capacity utilization under a cap-and-trade system, resulting in higher emissions of CO_2 and co-pollutants with direct negative health impacts.

These are not negligible concerns. Although the best solution might be to improve the general regulation of the co-pollutants in question to prevent hot spots or reduce their impacts on disadvantaged communities, this may not be feasible in the context of real-world regulatory politics. However, it should be possible to design a cap-and-trade program or related regulations in order to counter these effects,[113] or to use auction revenues to benefit impacted communities.[114]

I begin with a general discussion of the normative and economic arguments related to environmental justice concerns about co-pollutants and pollution hot spots in Part III.A, then consider real-world experience with the issue of hot spots and emissions trading programs in Part III.B.

In considering these arguments, it is important to keep in mind that the comparison has to be a relative one. If dirtier plants find it worthwhile to buy allowances in order to continue operation, they would probably also be willing to continue to emit and pay an emissions tax that had similar practical and financial effects on the company. Likewise, if the cheapest way for industry to comply is to reduce emissions at cleaner plants even further, rather than reducing emissions at dirtier plants, an agency issuing regulations might similarly find it appealing to focus on cutting emissions at the cleaner plants while imposing only token restrictions on the dirtier plants, particularly if the regulatory scheme is based on technological and economic feasibility. Thus, alternatives to cap and trade may also have equity effects that are quite similar. Even if cap and trade turns out to have undesirable equity effects, those effects

110. Alice Kaswan, *Reconciling Justice and Efficiency: Integrating Environmental Justice into Domestic Cap-and-Trade Programs for Controlling Greenhouse Gases*, *in* THE ETHICS OF GLOBAL CLIMATE CHANGE 232, 240 (Denis G. Arnold ed., 2011).

111. *See id.* at 241.

112. *Id.*

113. *Id.* at 249–52.

114. *Id.* at 252.

could be unavoidable given the need to reduce emissions. Rather than assuming that equity issues are unique to cap and trade, an equity-based critique of cap and trade should be accompanied by a showing that other approaches would actually reduce disparate treatment of disadvantaged groups within the context of a cap-and-trade program.

A. *Normative and Economic Arguments*

A major concern of environmental justice advocates is that emissions allowances might disproportionately end up in the hands of dirtier plants, which may themselves be disproportionately located in disadvantaged communities. This section will investigate the likelihood of this outcome and its normative implications. While the argument has intuitive appeal, upon closer examination, we will see that its validity depends on particular factual settings.

This section opens with a close examination of the potential industry decision to use a limited pool of allowances to maintain emissions at inefficient plants and to decrease emissions at efficient ones in order to achieve the reductions required by an industry-wide emissions cap. If lower production costs and lower emissions per unit of output are not correlated, the outcome of the analysis depends on the relative weight of these two factors. I will also assume that businesses base their decisions on rational strategies for making profits, and that regulations other than the cap-and-trade scheme do not interfere with decisions about production levels, fuel choices, or emission controls. As we will see, however, under most circumstances, the analysis of how emissions reductions are distributed among sources does not turn on the details of the cap-and-trade system such as the use of offsets, the availability of credit banking, or the initial allocation scheme—provided that the system is sufficiently credible (and any offsets are sufficiently expensive) and that emission allowances have a price greater than zero. Note, however, that these factors could become relevant if the dirtier plants are also the most efficient ones (in terms of the profit ratio per unit of emissions).[115]

The analysis below has a limited goal. It is not intended to "prove" that cap and trade never creates or intensifies hot spots of co-pollutants. There is no

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115. For example, Levine, Graves, and Metin estimate that

> at a CO_2 price of $10/ton, an efficient gas-fired plant (e.g., a combined cycle plant with a 7,000 Btu/kWh heat rate) will displace an inefficient coal-fired power plant in the dispatch order (at the assumed $6/MMBtu gas price and $1.70/MMBtu coal price) . . . [while] efficient coal plants can survive against some gas plants up to as high a price for CO_2 as $80/ton, at which point even an inefficient gas plant will displace a typical efficient coal plant (assumed to have a 9,000 Btu/kWh heat rate). Thus, coal is not thoroughly displaced by gas until CO_2 prices are in the range of $50–$100/ton . . . .

Steven H. Levine, Frank C. Graves & Metin Celebi, *Prospects for Natural Gas Under Climate Policy Legislation* 3, 4 fig. 2 (The Brattle Grp., Discussion Paper, 2010), *available at* http://www.eenews.net/public/25/14909/features/documents/2010/03/24/document_gw_01.pdf. Note, however, that this analysis could shift if other regulations of coal fired plants are implemented that increase costs, or if coal mining is subject to regulations that increase the price of coal substantially.

reason to think that this is impossible. In any event, because the analysis is based on certain assumptions, it does not purport to draw universal conclusions. Instead, it is intended to show that there is no intrinsic or abstract tendency of cap-and-trade systems to produce hot spots or differentially direct emissions reductions toward cleaner plants rather than the dirtier plants that are more likely to impact disadvantaged communities.[116] In short, there should be no presumption that cap and trade disfavors disadvantaged communities in terms of hot spots or co-pollutants.

Environmental justice advocates may well be right to argue for the contrary conclusion, given the actions of specific firms in a specific regulatory environment. This argument would require evidence based on specific conditions because of the weakness of the theory that cap and trade inherently disfavors disadvantaged communities. Detailed quantitative modeling of particular industries and regulatory schemes should be undertaken to search for potential inequitable changes in the geographic distribution of pollutants. Unless modeling demonstrates the potential existence of a problem, there is no reason to presume in advance that pollution reductions will be distributed unfairly.

Putting aside the empirical question of what impacts cap and trade actually has on emissions of co-pollutants in disadvantaged communities, I examine the normative question of how we should respond to whatever impacts actually result from cap and trade. It is reasonable to argue that emissions restrictions aimed at controlling greenhouse gas emissions in order to address climate change should also decrease the disproportionate air-pollution burden disadvantaged communities may already suffer. However, cap and trade may not lend itself to this form of affirmative action. To fully evaluate this argument, we would need to weigh this potential negative against the potential benefits of cap and trade, such as lower cost (which would translate into lower prices for consumers, including the disadvantaged) versus greater effectiveness. Higher energy prices are likely to have a regressive impact on low-income consumers, as I will discuss later.

From a practical standpoint, we also need to keep in mind the dangers of seeking the perfect regulatory scheme with no regard for political feasibility, rather than settling for a good approach that is politically achievable. For instance, we might hesitate before gambling the future of the planet on the hope that long-standing public attitude about taxes can be completely transformed to

116. The contrary assumption is common. For instance:

> Even without trading programs, "grandfathering" provisions in environmental laws that establish more lenient standards for existing polluters than for new polluters provide incentives for old, heavily polluting industries to continue to pollute. Trading programs will provide additional incentives for those facilities to continue to pollute and will perpetuate the distributional inequities that are already caused, in part, by "grandfathering" provisions.

Johnson, *supra* note 5, at 130.

a positive attitude, while resisting alternative methods to address climate change in the meantime.

1. Understanding Differential Incentives for Emissions Reductions Under Cap-and-Trade

The intuition underlying distributional concerns about emissions trading is that "[o]lder, heavily polluting industries may find that it is more cost-effective to continue polluting and to buy pollution rights than to install new technologies to reduce pollution."[117] However, this intuition may sound more plausible than it really is.[118] A cap-and-trade system is like a rationing system. Suppose you own a new car and an old clunker. It is difficult to imagine circumstances where the imposition of gasoline rationing would cause you to cut back on driving the new car more than the old car. It is equally implausible to assume that companies would cut back on efficient plants rather than less efficient ones when required to "ration" their pollutants.

Admittedly, it is more profitable for industry to continue to pollute than to install new technologies in those plants.[119] Therefore, companies would prefer to continue polluting at old plants rather than changing their ways. But this is not really the issue because an effective environmental trading scheme does not leave companies free to pollute. Capping emissions means that at least some companies will have to reduce pollution somewhere. So the central question is: Why would installing new technologies or reducing capacity at inefficient plants be less cost-effective than installing new technologies or reducing capacity at newer plants?

Under a cap-and-trade scheme, dirtier plants can only continue to pollute at precap levels if cleaner plants reduce emissions. Reducing emissions at a

117. *Id.* at 129. The same intuition would presumably apply to a pollution tax, so the analysis in the next few paragraphs of the text is equally applicable in that setting. Another principle of environmental justice is community participation. *See, e.g.*, Sheila Foster, *Environmental Justice in an Era of Devolved Collaboration*, 26 HARV. ENVTL. L. REV. 459 (2002) (discussing this aspect of environmental justice). Cap and trade might be criticized on this basis, since market transactions between polluters do not require community input. However, disclosure of transactions and their pollution impacts would at least give communities a chance to advocate program modifications. Although it is appealing to environmental justice advocates, the downsides of greater public participation are more delay and expense in issuing permits. As David Super observes, "the direct costs of the consultative processes and uncertainty about their outcomes make industry more resistant to regulation, possibly necessitating concessions on the substantive level of emissions reductions." Super, *supra* note 27, at 1152.

118. As a recent economic study explains, "market-based programs could mitigate pre-existing environmental justice problems. If relatively dirty facilities with low marginal abatement costs are disproportionately located in traditionally disadvantaged neighborhoods, a well functioning permit market should ensure that a larger share of the mandated emissions reductions will be achieved in these areas." Fowlie et al., *supra* note 64, at 11. My argument is that this phenomenon is more likely.

119. This is true unless companies are irrational, and, since irrational companies should be eliminated by the market over time, in general, companies should have already voluntarily installed pollution reduction technologies if doing so was cheaper than polluting. The fact that regulation is required at all shows that, currently, polluting is cheaper than not polluting. This assumes rational business actors that are well informed about the relative financial costs and benefits of different options.

cleaner plant makes business sense only if it is more cost effective than reducing emissions at a dirtier one. However, "[t]he economic logic of trading suggests that the largest, dirtiest facilities should be able to reduce emissions most easily (i.e., they should have relatively low marginal abatement costs), and hence emissions trading might lead to a cooling effect rather than the creation of hot spots."[120]

Some additional aspects of cap-and-trade schemes also deserve mention but do not change my analysis. First, a trading program may allow the use of offsets (emissions reductions that take place outside the group of regulated entities to compensate for in-system emissions) as an alternative to purchasing allowances. Authorizing the use of offsets should reduce demand for (and, therefore, the price of) allowances and create a market for the offsets alongside the allowance market. If the allowable level of offsets is set high enough that they completely eliminate the need to buy allowances, the cap-and-trade system will have no impact on emissions from industry and hence no effect on equity (measured relative to the preemissions market status quo). In short, the impact will be equal (zero) in all communities. If offset opportunities cost money and are limited in supply, the same question arises as for allowances: Why would a firm (or industry as a whole) use offsets to avoid pollution reductions from dirtier plants rather than cleaner ones? This makes sense only if pollution reductions (whether achieved via capacity-utilization reductions, fuel switching, or the installation of additional pollution control equipment) are more cost effective (relative to continued emissions plus offset cost) at the cleaner plants. In short, the key for determining where cuts will be made remains the relative cost effectiveness of cuts at different plants.

Second, some cap-and-trade systems provide for emissions allowance banking or borrowing. In order to bank emissions, a business decreases current emissions in order to save allowances for the future (either received free or purchased at auction), when it must choose to use the banked allowances against emissions from dirtier plants or cleaner ones (assuming it owns a mixture of both). Conversely, to borrow allowances, the firm decreases its future emissions allowance allotment in return for increased emissions today. Again, the question remains: Why use banked or borrowed allowances to increase allowable emissions at a dirtier plant rather than a cleaner one?

A third aspect of emissions trading systems that might seem pertinent is the initial distribution of allowances. However, under most circumstances this

120. Burtraw & Szambelan, *supra* note 49, at 8. They also report "empirical evidence from Phase I [of the Acid Rain Program] supporting the notion that the largest, dirtiest plants cleaned up the most. The greatest reductions in emissions by far (in tonnage and percentage) were in the Midwest, the area with the greatest power plant emissions historically." *Id.* However, another study investigated "the market-based system compared to a command-and-control alternative and [found] that low-income populations received slightly lower benefits on average from Title IV, echoing environmental justice concerns, although predominately black and Hispanic communities received a disproportionately large share of benefits relative to their costs." *Id.*; *see also supra* note 51 and accompanying text.

also turns out to be largely irrelevant to the choice between reductions at dirtier and cleaner sources.[121] If firms must purchase allowances by auction, they have to decide whether to buy allowances from the government or to reduce emissions instead. Assuming an effective cap (as all these thought experiments do), allowances are most valuable where emissions reductions are least cost effective. Similarly, when allowances are initially distributed for free, an owner must decide whether to use the allowances, buy more at the going market rate, or sell at that rate. Keeping the allowances is profitable if the cost to the company of reducing pollution is greater than the market price for allowances—that is, greater than what other firms are willing to pay (which is based on their own comparisons of market price and their emissions-reduction-related costs). Therefore, a firm should, for example, only keep allowances for its own use if it is unable to reduce its emissions as efficiently as other firms that might buy the allowances.

Despite all the potential variations of functional cap-and-trade systems, the bottom line is that firms will use allowances to cover emissions at plants where reductions are least cost effective. The details of the scheme make little difference because all trading schemes involve a limited supply of pollution rights (whether in the form of current allowances, borrowed future allowances, or offsets). If there is a limited supply of a commodity and a competitive market, the commodity will end up in the hands of the entities that are willing to pay the most for it. Since the alternative to purchasing an emissions allowance is to reduce emissions, the rights are most valuable to firms with the most expensive options for reducing emissions. The question is not whether companies would like to have full emissions rights for their most polluting sources but whether reducing emissions is more or less cost effective for dirty sources or cleaner ones.

In most industries, the cleaner plants are likely to have less "headroom" for improving their performances because they are closer to state of the art than older plants. In many circumstances, the cleaner plants will be the newer ones. Older plants are subject to less strict current regulation than newer ones because of the grandfathering issue discussed earlier.[122] For this reason, newer plants in the same industry are likely to use more advanced pollution control technology and/or cleaner fuels and will have a higher incremental emissions-reduction cost. Hence, in most industries, the newer plants would be likely to

121. A qualification is in order. If the method of allocation itself provides incentives for industry—for instance, by rewarding plants with high output or high capacity—then the industry's decisions about how to meet the cap will also be affected as firms attempt to increase their shares under the allocation system. *See* Rolf Golmbek et al., *Price and Welfare Effects of Emission Quota Allocation* 32 (Statistics Nor., Research Dep't, Discussion Paper No. 661, 2011), *available at* http://www.ssb.no/publikasjoner/DP/pdf/dp661.pdf.

122. Provisions of the Clean Air Act that are particularly aimed at new plants include 42 U.S.C. § 7411(f) (2006) (standards of performance for new stationary sources), § 7475 (preconstruction requirements), § 7502(c)(5) (permits in nonattainment areas), and § 7503 (permit requirements in nonattainment areas).

purchase allowances from older plants (or to outbid them if allowances are auctioned), thereby forcing emissions reductions at older plants. In other words, older plants often present more "low-hanging fruit" in terms of possibilities for additional pollution control.

Another way to reduce a plant's need for allowances is to decrease capacity utilization by reducing production levels (energy generation, in the case of a power plant). Reducing production decreases a source's total emissions (although not necessarily the emissions intensity per unit of production). Under some circumstances, it might be more economical to reduce capacity utilization at newer plants rather than older ones. One possibility is that production costs per unit of output are lower at the dirtier plant.[123] In this sub-Part, I have assumed that being economically efficient (having a low cost per unit output) and being clean (having low emissions per unit output) go together. If that assumption does not hold, however, the analysis becomes more complex, and the result depends on the scarcity of allowances (and hence their price).[124] In this scenario, there is a tradeoff between production costs and

123. This appears to generally hold true in today's electricity markets: older plants tend to be less energy efficient coal-fired plants and produce power more cheaply than newer plants, which tend to be more energy efficient natural gas-fired plants. As of the end of 2010, 73 percent of all coal-fired electricity generation capacity in the U.S. was at least thirty years old, while most natural gas-fired capacity was added during the last decade. *See How Old Are U.S. Power Plants?*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/energy_in_brief/age_of_elec_gen.cfm (last updated Aug. 8, 2011). Although natural gas-fired capacity now exceeds coal-fired capacity, coal-fired plants account for significantly more actual power generation. For example, in 2010, coal-fired plants generated 45 percent of our nation's electricity, while natural gas-fired plants contributed only 24 percent. *See Electric Power Annual 2011: Net Generation by Energy Source by Type of Producer*, U.S. ENERGY INFO. ADMIN. tbl.2.1.A (2011), *available at* http://www.eia.gov/electricity/annual/pdf/table2.1.a.pdf. This is due in large part to the economic reality that, per unit of power output, coal-fired plants currently have lower operational costs:

> In the United States, most baseload electricity generation is delivered from coal, nuclear, and hydroelectric power stations. Because natural gas tends to be a higher-cost fuel, natural-gas-fired power stations more typically are used to cover incremental power requirements that arise during times of peak demand or during sudden outages of baseload capacity.

ERIN MASTRANGELO, U.S. ENERGY INFO. ADMIN., AN ANALYSIS OF PRICE VOLATILITY IN NATURAL GAS MARKETS 3 (2007), *available at* ftp://ftp.eia.doe.gov/features/ngprivolatility.pdf. From 1999 through 2010, average annual operating expenses (including the costs of operation, maintenance, and fuel) for coal-fueled plants varied between 46 percent (in 2000, 2001, 2003, and 2005) and 73 percent (in 2010) of the operating expenses for natural gas-based plants per kilowatt-hour of electricity produced. *See Electric Power Annual 2010: Average Power Plant Operating Expenses for Major U.S. Investor-Owned Electric Utilities, 1999 Through 2010*, U.S. ENERGY INFO. ADMIN. tbl.8.2 (2011), *available at* http://www.eia.gov/electricity/annual/pdf/table8.2.pdf. During this time frame, the average annual operating expenses (per kilowatt-hour) for coal plants varied from 2.012–4.048 cents, while the range for natural gas-burning plants was 3.747–7.072 cents. *Id.* Natural gas price volatility is even more pronounced over shorter than annual periods of time. *See* MASTRANGELO, *supra*, at 16 (concluding that "[a] high degree of price volatility seems inherent in natural gas markets owing to the nature of the commodity, supply capacity constraints, and the sensitivity of peak day demands to temperatures" and that "even under relatively low levels of volatility, financial risk can be large as daily price movements expand"). Coal prices have not been nearly as volatile.

124. *See* ECON. AND ALLOCATION ADVISORY COMM., *supra* note 30, at 23–24.

efficiently reducing emissions.[125] The cheaper process will continue to be used until the price of allowances rises enough to outweigh the difference in production costs.[126] Here, the choice between reducing emissions at cleaner plants and dirtier ones could be affected by the availability of borrowing and offsets because this affects the price of allowances.

Because these issues are complicated, it may be easier to see the logic underlying the analysis by working through a specific example. The next sub-Part uses a simple hypothetical situation to tease out the logic of emissions cuts.

2. *An Illustrative Scenario*

Assume that a company owns two plants—a dirty plant and a clean one—and an emissions cap requires it to cut its total emissions by two units. Which plant will it pick for instituting the emissions reductions? Here are some specifics to make the example more concrete: Both plants produce the same product, and each unit of the product sells for $100. If the firm chooses to reduce emissions by cutting back production, two factors will determine which plant it chooses. First, if one plant produces fewer units of the regulated pollutant per unit of output than the other, the more polluting plant would require a smaller production cut to obtain the same emissions reduction. All things being equal, this makes cuts at more polluting plants more economical than cuts at less polluting plants. Second, the same production decrease might save more money at one plant than the other due to differences in production costs. If neither plant is currently operating at full capacity, we can assume that their current marginal costs of adding or subtracting one unit of production are the same. (Otherwise, the company could make money by shifting one unit of production from one plant to the other).

This example examines output cuts as a method of reducing emissions. Instead, reductions could be made through process changes (such as fuel switching) or installation of pollution control technology. Regardless, the central issue will be the relative cost effectiveness of emissions reductions at the two plants. This turns on the amount of investment or operational expense required to reduce emissions. Because process changes or pollution control equipment may require significant capital investments, the decision will depend in part on whether the cap requires sufficiently large emissions reductions to justify the investments. Thus, a large reduction requirement might make it worthwhile to make such an investment, whereas a small cut might not.

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125. According to the EPA, natural gas-fired generation results in "half as much carbon dioxide, less than a third as much nitrogen oxides, and one percent as much sulfur oxides at the power plant" as coal-fired generation. *Clean Energy*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html (last updated Dec. 28, 2007).

126. For example, Levine, Graves, and Metin estimate that allowance prices will need to rise above $10 before it becomes economical to do something about the most inefficient coal-fired plants. *See* Levine, Graves & Metin, *supra* note 115, at 3, 4 fig.2.

To return to the output-reduction example, let us assume that the current marginal cost at both plants is $95, so that cutting back by one production unit saves the company $95 in costs and loses it $5 in profits. Assume that an additional production cut (for a total cut of two units) saves another $90 in marginal costs.[127] Finally, the clean plant yields half the emissions per unit of production that the dirtier plant yields.[128] Therefore, a reduction of one unit of emissions requires cutting two production units at the cleaner plant or one at the dirtier plant.

We are finally in a position to work out the company's decision. It has two choices:

Cut back the cleaner plant's production by two units. This reduces revenue by $200 (at $100 per unit), and reduces costs by $95 for the first unit and $90 for the second unit. So the total loss of profit is: $200 – $95 – $90 = $15.

Cut back the dirtier plant's production by one unit. This reduces revenue by $100 and costs by $95, so the total loss of profit is $5.

Clearly, the company can maximize its profits by cutting production at the dirtier plant rather than the cleaner one. But note that this result hinges on the relative costs of production: if production costs are sufficiently higher at the cleaner plant, cutting two units at the cleaner plant might make more sense than cutting one unit at the dirtier one.

3. *Limitations on the Analysis*

This example allows us to spot scenarios where the result might be different. One possibility is that cutting two units would justify the company raising its prices. In a competitive market, this could not happen, but if the company is a monopoly and the regulator is sufficiently inept, perhaps cutting back two units would allow the company to raise its prices enough on all its production (as compared with a one unit cutback) to compensate for the loss of profits from the extra sales.

Another possibility is that the dirtier plant is dramatically cheaper to operate than the cleaner one. If the marginal cost at the dirtier plant is only half as high as the marginal cost at the cleaner one, then cutting two units at the cleaner plant might be more profitable than cutting one unit at the dirtier one. One might think that if the dirtier plant was that much cheaper to operate, the company would have simply built an identical new one. But perhaps regulations make new plants of this type less desirable, or even illegal, while grandfathering old ones. Note that in this case, it is at least clear that the cap-

127. The difference between $95 and $90 is based on the assumption that production becomes less profitable as a plant increases its level of output due to more wear-and-tear on equipment, more need for overtime, and so forth.

128. This is roughly the difference in carbon intensity between natural gas- and coal-fired plants. *Gas v. Coal*, GLOBAL GREENHOUSE WARMING, http://www.global-greenhouse-warming.com/gas-vs-coal.html (last updated Mar. 10, 2010).

and-trade scheme will not increase emissions at a dirtier plant that is already operating at capacity. Also note that only operating costs are relevant in determining production levels for existing plants: capital costs may be higher for new, cleaner plants, but those costs are fixed and have to be paid regardless of the production level.

There are other scenarios in which a cleaner plant might cut back more than a dirtier one. Perhaps the two plants produce different products (for instance, baseload power versus peak electricity), and demand for the two products changes differently due to the price increase caused by the output reduction under the cap-and-trade scheme.[129] In other words, demand is more elastic for one product than the other. Finally, in a regulated industry such as the retail electricity market, some quirk in the regulatory system might produce perverse results.[130]

These are some possible scenarios to consider, but ultimately the point is that there is nothing inherent in cap-and-trade systems that directs allowances to dirtier sources. If anything, in most industries efficiency and low emissions go together. We would normally expect new plants to be more economically efficient than old ones, because technological progress makes improvements possible and companies would normally want to take advantage of better technology when building new facilities. It is also more natural to assume that new plants are less emissions-intensive than old ones, both because greater efficiency should translate into producing more output with the same amount of energy and other inputs, and because pollution regulations for newer plants are likely to be tougher. These assumptions may sometimes fail, which is why we should not dismiss out of hand the concern that imposing an industry cap would result in more cuts at cleaner plants than dirtier ones. For instance, newer plants might be deliberately designed to make it easier to add further pollution control equipment in the future as needed, whereas no one imagined that further pollution controls would ever be needed when the old plants were built.[131]

Although my analysis is not ironclad, the empirical evidence cuts in its favor. For example, under the Acid Rain Program, regions with the dirtier plants ended up with the greatest percentage reductions.[132] Thus, rather than

129. For instance, if one plant produces only baseload power and the other only peak power, it may not be feasible to substitute one for the other. Or, if the same cap-and-trade scheme covers both electrical generators and non-power-producing industrial plants, the different economics of industrial production versus electricity production could affect the outcome.

130. For example, a regulatory agency might not set electricity prices in a way that gives a utility an incentive to minimize expenditures on emissions allowances or that penalizes it for selling unused allowances. Under these circumstances, the trading system may not direct allowances to the sources with the highest compliance costs.

131. Once the old plants have upgraded to match the newer plants, assuming that is possible, they will both face the same costs for further improvements, so both types of plants should then further reduce emissions proportionately.

132. *See, e.g.*, Swift, *supra* note 22, at 10–11. Swift also draws some conclusions from the data about fears of geographical shifts in pollution patterns:

allowances flowing disproportionately to the dirtiest plants, those plants on average used fewer allowances in proportion to their total emissions than the cleaner plants.

Similarly the most recent empirical study of the RECLAIM program reports that the dirtier plants – those sources with the highest emissions—made larger emissions reductions.[133] One finding showed that, "for each additional ton that a facility emitted in period 1, it reduced emissions between periods 2 and 3 by an additional 0.06 tons relative to the control group."[134] Since the control group consisted of plants subject to conventional pollution control regulations of the kind that would have applied in the absence of RECLAIM, this finding means that dirtier plants reduced emissions more under cap and trade than under conventional regulation. Indeed, it means that, relative to the status quo, the communities impacted by these dirtier plants received a larger benefit from cap and trade than communities near cleaner plants, narrowing the gap between these communities. Along with the results of the acid rain study, these empirical results are more consistent with the theory developed in this Article, which denies any systematic tendency of cap and trade to favor dirtier plants.

Of course, as discussed above, the general tendency of cap and trade to encourage cuts in dirtier plants does not always translate into reality. The empirical evidence discussed above applied in situations quite different from carbon trading, and we should be cautious about assuming that the findings carry over to other settings.[135] But the possibility that a particular trading

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> In particular, the concern that trading in the SO_2 program could result in "upwind" sources in the Midwestern region, disproportionately increasing emissions that affect "downwind" areas in the Northeast, did not occur. In fact, due to the number of large plants in the Midwest as well as Title IV's allocation method, there was a disproportionate decrease in emissions in the Midwest, as Midwest sources contributed a disproportionate 60 percent to 80 percent of emissions reductions. The working of the trading program helped to actually reduce emissions in this region with historically high SO_2 levels.
>
> An appropriate conclusion seems to be that in the power sector, any significant group of sources would be expected to behave similarly in a cap-and-trade program, and so negate the idea that there will be emissions shifting. Further research is needed on how many sources need to be included in a trading program in order for it to exhibit such consistency; the evidence from the OTC program at a state level suggests that even a few sources may be enough.

Id. at 16.

133. *See* Fowlie et al., *supra* note 64, at 32.

134. *Id.* at 34.

135. Modeling of carbon trading systems shows modest impacts on the use of coal versus natural gas. In the context of A.B. 32, the California Air Resources Board's economic analysis indicated decreases in both coal and natural gas in the electricity generation sector by 2025, with the decrease in coal use being much more pronounced in most scenarios. CAL. AIR RES. BD., UPDATED ECONOMIC ANALYSIS OF CALIFORNIA'S CLIMATE CHANGE SCOPING PLAN 115–18 (2010). An EPA study of proposed federal climate legislation showed an increase in the use of coal under business as usual, but a modest decrease under the proposed legislation, which included emissions trading. U.S. EPA, EPA ANALYSIS OF THE AMERICAN POWER ACT IN THE 111TH CONGRESS 43 (2010).

scheme could favor reducing emissions at cleaner plants rather than dirtier ones needs to be demonstrated, not simply assumed. Similarly, where it targets a heterogeneous industry or operates across multiple industries, we need some specific reason to believe that more polluting elements would cut back production less or adopt fewer technological responses in reaction to the cap-and-trade scheme.

4. Choosing a Baseline to Evaluate the Distributional Impacts of Cap-and-Trade: Status Quo or Command-and-Control?

While the foregoing discussion assumes that the baseline for analyzing the fairness of a cap-and-trade program consists of the emission levels prior to imposition of the cap-and-trade scheme, another possible baseline is an alternative regulatory scheme. For instance, we might assess a trading program's impact relative to a requirement that industry use the best available technology to reduce emissions. This is a difficult comparison to make for two reasons. First, it may be feasible to demand greater overall emission cuts through a cap-and-trade scheme because the cost is lower than with traditional regulations.[136] Second, it is not easy to forecast emissions under a hypothetical best-technology requirement. In order to make an accurate comparison, we would need to determine what the best technology regulation would require for each industry. This may be difficult to do without actually going through a parallel regulatory process, completing a full set of regulations, and then comparing the full program with cap and trade. If cap and trade reduces pollution levels for disadvantaged communities, but technology-based regulations produce even greater reductions for disadvantaged communities, this may count in favor of the technology-based regulations. As discussed above, this does not appear to have been true for the RECLAIM program. But, choosing the cap-and-trade system if it has other advantages that weigh heavily in its favor, such as lower overall cost, is not necessarily unjust. It is not clear that society should adopt unnecessarily expensive means of reaching a goal in order to aid disadvantaged communities, particularly if more cost-efficient ways of helping those communities exist.

Even if a technology requirement is more effective in reducing co-pollutants, it may not necessarily be more desirable, even from the perspective of disadvantaged communities. Because of its greater expense, it will curtail output more severely, resulting in higher consumer costs that will be felt disproportionately by low-income groups.[137] Moreover, it may not be possible

136. The cost difference can be quite large. *See* Dallas Burtraw, Anthony Paul & Matt Woerman, *Retail Electricity Price Savings from Compliance Flexibility in GHG Standards for Stationary Sources* 21 (Res. for the Future, Discussion Paper 11-30, 2011), *available at* http://www.rff.org/RFF/Documents/RFF-DP-11-30.pdf ("The largest change in consumer costs is an increase of $7 billion per year that occurs under the inflexible standard, due to the increase in electricity prices.").

137. *See* discussion *infra* Part IV.

to enact *any* emissions reductions without the cost-savings of the cap-and-trade scheme. We have seen how difficult it is to adopt CO_2 reductions in any form, and increasing the price or decreasing the political acceptability of the emissions reduction plan will only make the process more difficult.

Finally, it may be cheaper to use a cap-and-trade scheme to control one pollutant and other measures to control co-pollutants, rather than trying to do both through a single measure. Separate control measures, such as EPA's new regulation of toxic emissions by power plants,[138] can be aimed directly at specific co-pollutants. This approach is more efficient than modifying regulations of another pollutant in order to maximize reductions of the co-pollutant—the "two birds with one stone" technique is unlikely to be the most cost-effective way of achieving multiple reduction goals, even if emissions of the pollutants are frequently correlated.

Energy markets are very complex. Depending on the technologies and tax and regulatory policies involved, emissions trading programs and best-technology regulations may take different forms and have various effects on production and emissions. The qualitative arguments made here are no substitute for detailed modeling and empirical analysis. It may be true that direct regulation, while probably more expensive, would decrease emissions more than a cap-and-trade system. However, the initial plausibility of the idea that a market solution is inherently likely to increase or maintain emissions by dirtier emitters is less convincing upon closer examination. The plausibility factor derives from the observation that industry would like to continue using older, dirtier plants and would be happy to receive the emission allowances or offsets that would allow it to do so. But the assumption that this is likely to happen is weaker once we realize that emission allowances are in scarce supply, and that using these rights for dirtier plants means having to cut further emissions from cleaner plants.

5. *What Does Fairness Require?*

At this point, it is important to think more carefully about the concept of fairness. One might argue that fairness requires at least that disadvantaged communities should receive no greater pollution exposure due to the trading system than they received previously. At the other extreme, one might argue that their interests be given the highest priority, so that society should select the emissions reduction method likely to produce the greatest possible benefits for these communities.[139] Intermediate positions might use proportional reductions of co-pollutants across all communities as a benchmark, or require somewhat

138. Information about the rule and links to the rule and related documents can be found at *Mercury*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/hg/index.html (last updated Jan. 18, 2012).

139. Note, however, that this method would likely produce a higher cost of compliance, which would be felt by disadvantaged communities in the form of higher energy costs. *See* discussion *infra* Part IV.

greater than proportional reductions for disproportionately pollution-impacted communities as a form of affirmative action.

Without trying to fully resolve these normative issues—and absent very strong countervailing considerations—worsening the pollution burden for already disproportionately affected communities seems unacceptable. One countervailing consideration might be dramatically higher costs for alternative regulatory systems, which would be passed on to consumers and would disproportionately burden the same communities economically. Another countervailing consideration would be the political impossibility of instituting any other method for responding to a pressing emissions problem like climate change.[140]

In the context of climate change, it seems particularly misguided to give overriding priority to disadvantaged communities within the United States at the expense of even more disadvantaged communities elsewhere. From the point of view of social justice, they are not most at risk from climate change, which will have the cruelest impact on citizens of the poorest nations.[141] As the economist Thomas Schelling explains, "dikes can't save Bangladesh [from climate-change induced sea-level rise]: not only is there too much coastline, but dikes would produce fresh water floods [because] [r]ivers cannot rise up over a dike to reach the sea."[142] Therefore, "tens of millions of Bangladeshi would have to migrate or die."[143] Given the seriousness of the situation, we should not allow disputes about the impact of co-pollutants on disadvantaged communities in the United States imperil the adoption of effective climate policies.[144]

140. While we may agree on the importance of improving the welfare of disadvantaged communities, this cannot be the highest priority of every government program, particularly where that is not the program's main purpose. It is reasonable to argue that government actions should reduce the relative disadvantage of communities heavily burdened by pollution where feasible, but it is less clear how high a priority this should merit compared with other program goals. A stronger priority should attach to ensuring that the program does not harm disadvantaged communities compared with the status quo.

141. *See* ERIC A. POSNER & DAVID WEISBACH, CLIMATE CHANGE JUSTICE 39–40 (2010).

142. Thomas C. Schelling, *Climate Change: The Certainties, the Uncertainties, and What They Imply About Action*, 4 THE ECONOMIST'S VOICE 1 (2007).

143. *Id.* Additionally, climate change threatens current income levels in poor countries and the severe weather events and rainfall variability (especially drought) that accompany it impair their prospects for economic growth. *See* NICHOLAS STERN, THE ECONOMICS OF CLIMATE CHANGE: THE STERN REVIEW 123–24 (2007).

144. To be sure, environmental justice advocates in the United States may doubt the actual effectiveness of cap-and-trade systems. However, as the Introduction explains, that issue is beyond the scope of this Article. If an emissions trading program would not be effective, obviously it should not be used. However, that conclusion does not require basis in equity concerns. This Article is focused on the question of whether cap and trade is fair, not whether it represents the optimal regulatory approach given all possible alternatives.

B. The Hot Spot / Co-Pollutant Problem in Real Trading Schemes

Although empirical evidence is limited, it seems not to support concerns that hot spots will necessarily develop as a result of cap-and-trade programs. The oldest and best-tested program, the U.S. Acid Rain Program, does not appear to have led to increased emissions of the capped pollutants in high-percentage minority communities—although "poorly educated communities" did experience increased SO_2 emissions as a result of trading.[145] Even with respect to the RECLAIM program, which sparked great criticism among environmental justice advocates, evidence suggests that the hot spot issue was greatly overblown. In particular, an empirical study analyzing data from the period from 1990 to 2005 concluded that the program's emission reductions were spread across communities—that is, disadvantaged communities did better with emissions trading than they would have under conventional regulation.[146] The study found that sources in the program reduced their emissions approximately 20 percent more than similar sources covered by conventional pollution control regulations, presumably because the lower cost of the program made it politically feasible to mandate greater pollution reductions.[147] Further, it found that no particular demographic group experienced higher pollution exposures relative to the use of conventional regulations.[148] However, the benefits beyond those of conventional regulation were not spread equally, with high-income households and whites receiving the largest reductions in pollution relative to conventional regulation.[149] Still, the key lesson is that no group was harmed by the use of cap and trade versus conventional pollution reductions. It may be regrettable that the greatest pollution reductions did not flow to the disadvantaged, but they are still better off than under conventional regulation.

Whether the benefits from co-pollutant reductions are distributed fairly has emerged as a significant issue in the debate about California's new cap-and-trade system for greenhouse gases.[150] The Global Warming Solutions Act, commonly known simply as "A.B. 32," is one of the most ambitious efforts in the world to attempt to address climate change.[151]

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145. *See* Ringquist, *supra* note 51 and accompanying text.

146. *See* Fowlie et al., *supra* note 64, at 35. For background on the RECLAIM program's development, see Dale B. Thompson, *Political Obstacles to the Implementation of Emissions Markets: Lessons from RECLAIM,* 40 NAT. RESOURCES J. 645 (2000). In Fowlie et al., *supra* note 64, at 2 app. B, the authors report the results of previous studies, which ranged widely in terms of their assessments of the RECLAIM program.

147. *See* Fowlie et al., *supra* note 64, at 35.

148. *See id.*

149. *See id.*

150. For information about A.B. 32, see *Assembly Bill 32: Global Warming Solutions Act*, CAL. AIR RES. BD., http://www.arb.ca.gov/cc/ab32/ab32.htm (last visited Jan. 23, 2012).

151. For details about the proposed regulations and their likely effects on emissions, see Rhead Enion *California Cap-and-Trade Math*, LEGAL PLANET (Nov. 16, 2010), http://legalplanet.wordpress.com/2010/11/16/california-cap-and-trade-math/. According to Enion:

A.B. 32 explicitly recognizes the importance of environmental justice. It mandates that the implementing agency—the California Air Resources Board (CARB)—consider emissions impacts, "including localized impacts in communities that are already adversely impacted by air pollution," and design any trading system "to prevent any increase in the emissions of toxic air contaminants or criteria air pollutants" such as SO_2, NO_X, and particulate matter.[152] This language suggests that CARB is mandated to avoid increases in co-pollutants compared with the status quo, but otherwise need only consider localized effects as one factor in its deliberations.

Under section 38591, an Environmental Justice Advisory Committee must advise the regulator.[153] In a letter from October 1, 2008, the advisory committee expressed concern that the public health impacts of a cap-and-trade program were not being sufficiently considered and complained about the lack of consideration of using a carbon fee as an alternative to carbon trading.[154]

The advisory committee's concerns were not accepted by the government. In a 2010 study, the California Department of Public Health considered the possibility of hotspots and the effect of A.B. 32 on conventional pollutants, such as particulates, and concluded that "the potential negative health effects from a cap-and-trade program in California are expected to be negligible to minor, and readily mitigated with targeted mitigation efforts."[155] The CARB estimated that the cap-and-trade measures would lead to about a 4 percent

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> If covered emitters take full advantage of the 8% allowed offsets, the first year when emitters will need to reduce their actual business as usual (BAU) emissions is 2017. This assumes efficient use of banking and full offsets.
>
> If covered emitters also tap into the CARB reserve along with the 8% offsets, then 2019 is the first year when the cap will be low enough to require more than offsets and reserve credits to meet the cap.
>
> If covered emitters reduced emissions 6.6% below the BAU forecast each year, the rest of reductions could be met through offsets and banking through 2020.
>
> 2015 is a crucial year for the cap-and-trade program. The expansion of the cap to accommodate emissions from distributed use of fuels more than doubles the cap and therefore the amount of emission allowances (and offsets) in play.

Id. If these projections are right, the trading system would not become relevant until 2020. One climate change expert characterized the proposed rule as "in its major structural components . . . one of the most thoughtfully designed cap-and-trade programs proposed to date." Michael Wara, *At Least 1 Flower Blooms: CARB Releases Cap-and-Trade Draft Regulation*, ENVTL. & ENERGY INSIGHTS (Nov. 5, 2010), http://blogs.law.stanford.edu/enrlp/2010/11/05/at-least-1-flower-blooms-carb-releases-cap-and-trade-draft-regulation/.

152. CAL. HEALTH & SAFETY CODE § 38570(b)(1)–(2) (West 2011).

153. CAL. HEALTH & SAFETY CODE § 38591 (West 2011).

154. Letter from the Environmental Justice Advisory Committee on the Implementation of the Global Warming Solutions Act of 2006 to Chairman Mary Nichols and Exec. Officer James Goldstene of the Cal. Air Resources Bd. 1 (Oct. 1, 2008) (supplying the committee's recommendations on the Draft AB 32 Scoping Plan), *available at* http://www.arb.ca.gov/cc/ejac/ejac_comments_final.pdf [hereinafter AC Letter].

155. CAL. DEP'T OF PUB. HEALTH, HEALTH IMPACT ASSESSMENT OF A CAP-AND-TRADE FRAMEWORK 5 (2010).

overall decline in criteria pollutants from the electricity sector.[156] Based on detailed case studies of four communities, the CARB concluded that emission decreases were likely, but that even in the unlikely event that cap-and-trade scheme resulted in higher emissions than under business as usual, the increases would be relatively insignificant because they would be dwarfed by other trends.[157]

When CARB failed to adopt the suggestions of the Environmental Justice Advisory Committee, environmental justice advocates filed suit.[158] The trial judge ruled that CARB had violated the California Environmental Quality Act (CEQA) because it had not adequately analyzed alternatives to a cap-and-trade system.[159] However, the court held that, by using a study of a specific, "typical" community to analyze potential environmental justice impacts, CARB successfully fulfilled its duty to consider the local effects of reducing co-pollutants.[160] In response, CARB issued a new environmental assessment that adopts a strategy of adaptive management to deal with potential co-pollutant impacts.[161] The assessment forecasts that localized air quality impacts are

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156. CAL. AIR RES. BD., CO-POLLUTANT EMISSIONS ASSESSMENT P-44 app. P (2010) http://www.arb.ca.gov/regact/2010/capandtrade10/capv6appp.pdf. In terms of power plants, CARB believed that the system would have only a small effect on emissions:

> Any regulation that seeks to reduce carbon from the electricity that California uses, whether a cap-and- trade regulation, a carbon fee, or direct regulations, would provide similar incentives to shift from coal to natural gas. Many other external factors, such as transportation costs, pipeline capacity, demand by a growing population, and other environmental programs, affect decisions on whether to increase operation of existing power plants, build new power plants, or the potential location of these power plants. While cap-and-trade will be one more consideration, ARB staff expects that these market, economic, and infrastructure factors will continue to drive such decisions.

Id. at P-49.

157. *Id.* at P-125.

158. *See supra* note 6 and accompanying text.

159. *See* Ass'n of Irritated Residents v. Cal. Air Res. Bd., No. CPF-09-509562, at 3–4 (Cal. Super. Ct., Dec. 16, 2011).

160. *Id.* at 16. In more detail, the case study functioned as follows:

> ARB and the California Department of Public Health (CDHP) [ ] completed a joint cumulative impacts study of the AB 32 cap-and-trade regulations. ARB analyzed air impacts and CDHP carried out a limited Health Impact Assessment. The City of Richmond was one of four representative areas chosen for detailed analysis. The air pollution assessment focused on emissions from industrial and electricity generating facilities subject to the cap-and-trade regulation. It evaluated two scenarios that could produce negative impacts, one where the seven "cap-and-trade" facilities in the Richmond area increased their emissions by 4 percent, and another where a new power plant would be established in the area. Under each scenario, the impact of increased air pollutant emissions was predicted to be negligible or minor.

Ken Kloc, *Air Pollution & Environmental Inequity in the San Francisco Bay Area* 17–18 (Ctr. on Urban Envtl. Law, Gray Paper No. 1, 2011), *available at* http://digitalcommons.law.ggu.edu/cgi/viewcontent.cgi?article=1443&context=pubs. Kloc offers some criticisms of the study. *See id.*

161. *See* CAL. AIR RES. BD., SUPPLEMENT TO THE AB 32 SCOPING PLAN FUNCTIONAL EQUIVALENT DOCUMENT 16 (2011), *available at* http://www.arb.ca.gov/cc/scopingplan/document/Supplement_to_SP_FED.pdf.

"highly unlikely" and spatially uncertain,[162] but expresses a "commitment to monitoring the data on localized air quality impacts and to adjusting a Cap-and-trade Regulation adopted, if warranted."[163]

The California experience and recent studies suggest a combination of measures to deal with potential fairness issues regarding co-pollutants. The first is a consideration of projected impacts on sample communities. The second is the use of adaptive management to the extent that unforeseen impacts might arise in the future.[164] The appropriate tool, if such impacts do arise in the future, would depend on the situation. Some possibilities include geographic restrictions on trading, increased regulation of the co-pollutants, and use of auction proceeds to fund environmental improvements or pubic health programs in the impacted communities.[165]

A related problem is posed by the use of offsets.[166] Greenhouse gas offsets, also commonly called carbon offsets, allow an emitter to meet the requirements of a cap-and-trade scheme by purchasing a greenhouse gas reduction by a party that is outside the trading system.[167] Offsets might take the form of reduced emissions in the United States or perhaps elsewhere through methods such as the substitution of a natural gas electricity generator for a coal-fired generator in China. Alternatively, they might involve the creation of new carbon sinks.[168] If an offset system is properly designed, it

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162. *Id.*

163. *Id.* at 33. In December 2011, the judge ruled that the updated assessment adequately justified CARB's decision to select a greenhouse gas emissions trading program. *See* Debra Kahn, *Judge Deems State's Cap-and-Trade Plan in Compliance with State Law*, CLIMATEWIRE (Dec. 8, 2011), http://www.eenews.net/climatewire/2011/12/08.

164. This Article does not argue that disproportionate distributions of co-pollutants should be ignored. But the treatment of these issues must be more nuanced than simply rejecting a whole approach to regulation (e.g., cap and trade). Instead, I agree that

> [e]ffective and equitable climate change mitigation will likely not be in the form of a fixed silver bullet strategy that is uniformly applied across geographic space. Instead, these actions will likely necessitate multiple responses within one or more adaptive frameworks that take into account the heterogeneity of the human populations they seek to protect.

Shonkoff et al., *supra* note 29, at 176.

165. *See* Alice Kaswan, *Environmental Justice and Domestic Climate Change Policy*, 38 ENVTL. L. REP. 10,287, 10,303 (2008), *available at* http://www.elr.info/articles/vol38/38.10287.pdf.

166. Offsets have been an important component of U.S. climate legislative proposals. *See, e.g.*, JONATHAN L. RAMSEUR, CONG. RESEARCH. SERV., RL34436, THE ROLE OF OFFSETS IN A GREENHOUSE GAS EMISSIONS CAP-AND-TRADE PROGRAM: POTENTIAL BENEFITS AND CONCERNS 1 (2008) ("An offset is a measurable reduction, avoidance, or sequestration of GHG emissions from a source not covered by an emission reduction program. If a cap-and-trade program includes offsets, regulated entities have the opportunity to purchase them to help meet compliance obligations.").

167. For an introductory discussion of offsets and their potential problems, see Michael Wara, *Measuring the Clean Development Mechanism's Performance and Potential*, 55 UCLA L. REV. 1759 (2008).

168. For example:

> Trees, plants, and soils sequester carbon, removing it from the earth' s atmosphere. Biological sequestration projects generally involve activities that either increase existing sequestration; or maintain the existing sequestration on land that might otherwise be disturbed and release some or all of the sequestered carbon. This offset category includes

lowers the overall cost of reducing CO_2 because it offers sources within the trading system the option of using offsets when doing so is cheaper than buying allowances or reducing their own emissions.[169] However, it does so by requiring fewer in-system emissions reductions than would otherwise be required and, therefore, results in correspondingly smaller reductions of in-system co-pollutants. Thus, a trading system that allows offsetting has fewer collateral co-pollutant benefits, particularly for lower-income communities in high pollution areas, than alternatives such as a carbon tax or direct regulation or cap and trade without offsets.[170] On the other hand, the reduced cost of the system should mean significantly lower energy costs, which is in the interest of low-income communities.[171]

Ideally, co-pollutants would already be subject to optimal regulatory control to minimize potential harm to disadvantaged communities. If that is not currently the case, it is still better, in principle, to deal with co-pollutants separately, rather than allowing them to influence the choice of the regulatory instrument used to achieve CO_2 emissions reductions or the specific design of a CO_2 trading system. As mentioned in Part III.A.4, co-pollutants are not perfectly correlated with CO_2 emissions, so reducing CO_2 is an imprecisely targeted way of reducing its co-pollutants.[172] Additionally, steps taken to

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> sequestration that results from agriculture and forestry activities, and is sometimes referred to as land use, land use change and forestry (LULUCF) projects.

RAMSEUR, *supra* note 166, at 5.

169. According to Ramseur:

> A central argument in support of offsets is that their use makes an emissions reduction program more cost-effective. A wide range of activities could be undertaken that would generate offsets. Many of these individual activities would likely generate a relatively small quantity of offsets (in terms of tons), but in the aggregate, their climate change mitigation potential is substantial. Arguably, direct regulation of these sources—either through a cap-and-trade program or regulatory command-and-control provisions—may not be cost-effective because of the administrative burden.

Id. at 12.

170. Offsetting also raises other concerns, for example:

> [T]he primary concern regarding offsets is their integrity. To be credible, an offset should equate to an emission reduction from a direct emission source, such as a smokestack or exhaust pipe. This issue is critical, if offsets are to be used in an emissions trading program. However, implementing this objective would likely present challenges.

Id. at 18. Finally, there are reasons for concern about the environmental impacts of offset projects. *See* Kylie Wilson, *Access to Justice for Victims of the International Carbon Offset Industry*, 38 ECOLOGY L.Q. 967 (2011).

171. *See* Burtraw, Paul & Woerman, *supra* note 136, at 3, 14 (reporting that a flexible standard, involving at least some trading, produces dramatically smaller increases in consumer prices and finding that technology-based standards result in retiring more older coal plants from service, while a flexible standard results in greater energy efficiency improvements).

172. Schatzki and Stavins argue that

> [w]hile some propose placing various restrictions or conditions on emission allowance trading in a GHG cap-and-trade system in order to achieve particular environmental justice objectives, such modifications would have highly uncertain impacts on air quality because of the complex and varied relationships between GHG and co-pollutant emissions. Not only

reduce CO_2 are just a subset of the possible ways of reducing the co-pollutant, and it can only be by coincidence that this subset contains the ideal way of reducing the co-pollutant. However, given the complicated politics of pollution control, the ideal approach may not always be feasible in practice.

It is important to be realistic about our alternatives. Failure to regulate at all carries clear costs for disadvantaged communities in the form of emissions impacts. Even if technology-based regulation would reduce co-pollutants more than a cap-and-trade system, there are tradeoffs. If the economic theory behind cap and trade is correct, technology-based regulation may cost more to achieve comparable total emissions reductions, increasing the financial burden on low-income consumers in the form of higher energy prices.[173]

In situations where hot spots of the regulated pollutant itself are a problem, it may well be worth redesigning the cap-and-trade system accordingly. For example, despite being relatively well mixed in the atmosphere, some research suggests the possibility that there may be localized heat island effects around major sources of CO_2 that can lead to increased concentrations of health-hazardous ground-level ozone and particulate matter.[174] Furthermore, a recent economic study shows that adjusting the trading program can provide substantial benefits when pollution damages vary significantly with location.[175] But it is unclear how frequently such geographic

> does the relationship between GHG and co-pollutant emissions vary widely across sources, but so does the relationship between reductions in GHG and co-pollutant emission achieved by various abatement options. Further, unlike the benefits from reducing GHG emissions, the health and environmental benefits from reducing co-pollutants can vary substantially depending on where and when those reductions occur.

TODD SCHATZKI & ROBERT N. STAVINS, ANALYSIS GRP., INC., ADDRESSING ENVIRONMENTAL JUSTICE CONCERNS IN THE DESIGN OF CALIFORNIA'S CLIMATE POLICY ii (2009), *available at* http://www.analysisgroup.com/uploadedFiles/Publishing/Articles/Environmental_Justice.pdf. As they explain:

> [O]n average, fuel combustion in electricity generation and petroleum refining generates less than one pound of NO_X emissions per metric ton of GHG emissions. By contrast, fuel combustion in other manufacturing and industrial sectors generates about five pounds of NO_X emissions per metric ton of GHG emissions, and fuel use by heavy-duty trucks generates about 25 pounds of NO_X per metric ton of GHG.

Id. at 6.

173. *See* discussion *infra* Part IV.

174. *See* Leber, *supra* note 25.

175. *See* MEREDITH FOWLIE & NICHOLAS MULLER, DESIGNING MARKETS FOR POLLUTION WHEN DAMAGES VARY ACROSS SOURCES: EVIDENCE FROM THE NO_X BUDGET PROGRAM 2 (2010), *available at* http://ei.haas.berkeley.edu/pdf/seminar/Seminar20111202.pdf. A countervailing concern is that making such adjustments would limit the scope of trading and impair the operation of the market:

> The difficulty stems from the restricted opportunities for trade and added transaction costs that are integral to the imposition of a layer of spatial limitations upon pollution markets. As a result of these concerns, Congress rejected proposals to incorporate geographical restrictions into the SO_2 cap-and-trade program it instituted under the 1990 Clean Air Act. In similar fashion, the South Coast Air Quality Management District . . . did not restrict the location of nitrogen oxide and sulfur oxide trades in pollution rights under the . . . [RECLAIM] program instituted in 1992.

disparities exist in CO_2 impacts based on local variations in emissions or whether they correlate with socioeconomic boundaries.

To summarize, cap and trade does not appear to have an intrinsic tendency to favor emissions reductions at cleaner plants as opposed to the dirtier plants that may more often exist in disadvantaged communities. If anything, the general tendency is to the contrary. Unless there are specific features of the regulated industry or modeling results that suggest otherwise, fairness to disadvantaged communities should not serve as an obstacle to use of cap and trade. However, if emissions trading does turn out to result in disproportionate levels of co-pollutants in disadvantaged communities, the regulator should be prepared to take appropriate action to address the situation and counteract that effect.

IV. FAIRNESS TO LOW-INCOME CONSUMERS

Because of the scale of the climate change problem, the costs of transitioning to a low-carbon economy will be large and the process will be lengthy. Putting a price on carbon—whether through a trading system, a carbon tax, or otherwise—will increase energy costs. Even if a cap-and-trade program distributes allowances for free, the existence of a cap will force industry to reduce its total emissions by reducing output, installing new technologies, or switching to cleaner-burning fuel, all of which will increase prices.[176] In this respect, it has a similar effect to a carbon tax. Indeed, a system of technology-based regulations would also impose costs on utilities that would be passed along to consumers in the form of higher energy costs.

Aside from the general effects of capping emissions on consumers as a whole, there are likely to be enhanced ramifications for the subset of "low-income" consumers that are directly relevant to equity analyses. Therefore, if cap and trade allows society to obtain comparable environmental benefits to conventional regulation at a lower cost, this feature has implications for social equity as well as for regulatory efficiency. Lower program costs mean less expense to be passed along to consumers. This decrease in the economic burden of regulation has particular significance for low-income consumers. Therefore, cap and trade may have equity benefits as well as efficiency benefits over other forms of emissions regulation—assuming, of course, that the system works as planned.

The equity implications of emissions trading are particularly important for direct energy costs (differentiated from indirect energy costs associated with energy intensive goods and services). For example, economic analysis indicates that 90 percent of a carbon tax on coal would be shifted to consumers through energy prices, illustrating why keeping compliance costs low is important for

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Morag-Levine, *supra* note 29, at 198.

176. *See* discussion *supra* Part II.B.

consumers (especially low-income consumers who can least afford price increases).[177] Increases in energy prices are regressive: "They impact the poor more than the rich, since the poor spend a larger portion of their budgets on basic needs, like heating and power."[178] This regressive effect could be partially ameliorated by subsidizing the adoption of efficiency measures in low-income households.[179] Energy efficiency measures have a dual effect: they reduce energy use and hence emissions, thus helping to meet the cap, while also providing cost savings to offset the higher energy prices caused by climate change mitigation efforts.

Determining who ultimately pays the price on carbon, and how the burden correlates with wealth, is not a simple matter. Using current household income as a gauge may be misleading since some households with low incomes might be composed of students who will likely enjoy a higher income later in life or of retirees who enjoy a better standard of living due to savings than their present income would suggest.[180] For instance, a law student would register as having a low income, even if the student was from an affluent background and would later enjoy a high income as a law firm partner. Similarly, a retired person might enjoy a high standard of living by drawing down savings, but might also have a low income derived from current profits on investments. Both individuals may be less deserving of solicitude than others who are mired in a lifetime of poverty. Thus, there is an argument that the accuracy of the analysis can be improved by considering equity in terms of an individual's income over a whole lifetime, rather than at any one given moment.

In a social equity analysis, considering impacts over a lifetime may make a substantial difference. Putting a price on carbon seems "considerably less regressive when lifetime income measures are used than when annual income measures are used."[181] However, lifetime income is subject to considerable uncertainties because it "relies on strong assumptions about household consumption decisions . . . ." For example, it assumes that consumers are completely rational about borrowing and saving to smooth out their consumption over their entire lives.[182] In addition, it is normatively questionable whether a low-income household's present needs should receive

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177. *See* Sebastian Rausch, Gilbert Metcalf & John M. Reilly, *Distributional Impacts of Carbon Pricing: A General Equilibrium Approach with Micro-Data for Households* 4 (Nat'l Bureau of Econ. Res., Working Paper No. 17087, 2011), *available at* www.nber.org/papers/w17087.

178. Alice Kaswan, *Greening the Grid and Climate Justice*, 39 ENVTL. L. 1143, 1155 (2009); *see also Dinan Testimony*, *supra* note 94, at 6 ("[M]easured as a share of income, spending on energy-intensive items by households in the lowest income quintile averages more than five times that by households in the highest income quintile.").

179. *See Dinan Testimony*, *supra* note 94, at 17 ("Using revenues from auctioning allowances to subsidize household investments that reduced carbon dioxide emissions would lower the cost to households of adapting to higher energy prices. For example, subsidizing weatherization improvements would enable house-holds to use less energy for heating and cooling.").

180. *See* Rausch, Metcalf & Reilly, *supra* note 177, at 14.

181. Metcalf, *supra* note 91, at 404.

182. *Id.* at 405.

less attention on the basis that it has experienced or will experience higher income at some other point in time. For instance, a law student may be struggling to make ends meet notwithstanding the likelihood of higher income in the future. Because of the empirical issues and the unresolved normative questions, it would be a mistake to rely exclusively on lifetime income analysis in considering equity.

Regardless of which approach we use to assess economic impacts on consumers, a key social equity issue in emissions trading is: who captures the value of emissions allowances? Or, to put it another way, who collects the carbon price? The situation is actually quite complicated.

For example, allowance value may be captured by energy firms if distribution is free or by the government if allowances are auctioned, and, in either case, taxes and government spending can redistribute the benefits.[183] Therefore, quite apart from the distinction between free and auctioned allowances, pricing carbon may have a host of indirect effects that could influence wages and returns on capital, which themselves will impact income distribution. If allowances are free, energy firms and their shareholders will have higher income, which may be taxed by the government, or firms may engage in greater expenditures that are subject to a value-added tax (in countries that have such taxes).[184] If, on the other hand, the government collects revenue from auctioning allowances, it can either spend those funds or reduce other taxes. This choice, too, will impact demand for energy by the recipients of the benefits, and hence energy prices and availability. Additionally, because the government is itself a direct (and indirect) energy consumer, taxpayers must absorb higher government energy costs.

Untangling these effects is no simple matter, but the overall effect of a cap-and-trade system (or other emissions reduction regulation scheme) likely burdens poorer households more than richer ones. The specific distributional effects depend on the overall strategy, involving not just the cap-and-trade system but also tax policy. For example, a 2002 analysis demonstrated that, if the government gave emissions allowances away for free *and* used the increased taxes received from the resulting firm revenues to reduce the corporate tax rate, lower income households could lose up to 6 percent of their income, whereas wealthy households could actually see an increase in income.[185] On the other hand, the study found that cap-and-trade programs that

183. *See, e.g.*, *Dinan Testimony*, *supra* note 94, at 7.

184. *See* Cait Murphy, *Will the U.S. Adopt a Value-Added Tax?*, CBS MONEYWATCH (Apr. 9, 2010), http://www.cbsnews.com/8301-505123_162-51411133/vat-will-the-us-adopt-a-value-added-tax/ (describing a value added tax as a tax on all goods and services that is assessed at every "stage of production and distribution" with each business in the chain deducting the tax the previous business paid so that each is responsible only for paying tax on the quantum of value it added).

185. Terry Dinan & Diane Lim Rogers, *Distributional Effects of Carbon Allowance Trading: How Government Decisions Determine Winners and Losers*, 55 NAT'L TAX J. 199, 213 (2002). Note that there are some technical issues with estimating household consumption that could significantly affect this result. *See id.* at 209–10.

encompassed international trades improved the financial situation of lower income households compared with wealthier households.[186] Broadening the geographic scope of trading provides more opportunities for companies that can reduce emissions more cheaply to sell their allowances; this in turn brings down the price of allowances so that utilities have lower costs, resulting in decreased energy expenditures for low-income consumers.[187]

It is helpful to distinguish between auctioning and free distribution. The immediate effect of auctioning emissions allowances is equivalent to a carbon tax, which falls most heavily on lower-income households.[188] However, this regressive effect could be countered by changes in the income tax such as refundable tax credits for energy expenditures, resulting in distributional neutrality.[189] Moreover, the income sources, such as government transfer payments, of some members of low-income households may be less affected by carbon pricing, thereby reducing regressive effects.[190] A recent study indicates that the distributional impacts of an auction-based allowance trading program are small if government revenues are returned to individuals in the form of a taxable "dividend."[191] In fact, the impacts might even be progressive if revenues are used either to improve the tax treatment of low-income individuals by decreasing payroll taxes or expanding the earned-income credit[192] or to fund an energy benefit program (administered, for example, with food-stamp benefits) to help cover energy costs.[193]

On the other hand, free distribution is more regressive than auctioning[194] because the primary beneficiaries are the shareholders of companies that are able to sell extra allowances, and shareholders are rarely poor people.[195] Free distribution raises energy prices—because companies must still reduce

186. *Id.* at 219.

187. *Id.*

188. Metcalf, *supra* note 91, at 407.

189. *Id.* 406–07.

190. *Id.* at 413.

191. *See* Dallas Burtraw, Richard Sweeney & Margaret Walls, *The Incidence of U.S. Climate Policy: Alternative Uses of Revenues from a Cap-and-Trade Auction* 14 (Res. for the Future, Discussion Paper 09-17-REV, 2009), *available at* http://www.rff.org/RFF/Documents/RFF-DP-09-17-REV.pdf ("[H]ouseholds in the lowest deciles see a dramatic improvement in their well-being as a result of the lump-sum dividend of allowance revenues.").

192. The effect on low-income households is quite dramatic: "As expected, households in the lower-income deciles benefit the most from this policy. The average household in the first decile experiences a net consumer surplus gain of nearly 4.56 percent of income." *Id.* at 21.

193. *See Dinan Testimony*, *supra* note 94, at 16.

194. *See* Joshua Blonz, Dallas Burtraw & Margaret A. Walls, *Climate Policy's Uncertain Outcomes for Households: The Role of Complex Allocation Schemes in Cap-and-Trade*, 10 B.E. J. OF ECON. ANALYSIS & POL'Y (2010). For instance, according to Burtraw, Sweeney & Walls, *supra* note 191, at 3–4, one study found that the "distributional outcome hinges crucially on whether allowances are grandfathered or auctioned and whether revenues from allowance auctions, or from indirect taxation of allowance rents, are used to cut payroll taxes or corporate taxes or provide lump-sum transfers."

195. Burtraw, Sweeney & Walls, *supra* note 191, at 5.

emissions, buy extra allowances, or pay for offsets—and provides no direct mechanism for offsetting this additional burden.[196]

In the United States, recent congressional proposals to establish greenhouse gas cap-and-trade systems have included complex allowance allocation schemes, incorporating mixtures of free distribution, auctions, and various other revenue mechanisms such as requirements to use some allowance proceeds to reduce consumer costs.[197] A recent study suggests that the overall effect of these proposals would be progressive.[198] A relatively simple alternative would be a cap-and-dividend approach: selling some allowances and using the proceeds to fund a per capita payment to individuals.[199] Other methods of dealing with equity concerns exist—for example providing a refundable income tax credit.[200]

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196. To be sure, since retail electricity markets are highly regulated, offsetting subsidies could be provided to low-income consumers at the expense of other users. However, these subsidies would lower the incentive for low-income consumers to decrease their energy use. Another option would be to allow consumers to sell offsets based on their decreased energy use or other carbon-positive measures. *See* Michael Vandenbergh & Brooke A. Ackerly, *Climate Change: The Equity Problem*, 26 VA. ENVTL. L.J. 55 (2008). Under either free distribution or auctioning, progressive energy pricing (which ratchets up energy costs in standard increments above a base level) would ensure that the marginal rate of keeping surplus lighting on in a mansion is not the same as the energy cost of turning on a single bulb in a studio apartment.

197. Blonz, Burtraw & Walls, *supra* note 194, at *2.

198. *Id.* at *3. The United States also has several existing programs specifically designed to assist low-income households with energy costs. *See* Super, *supra* note 27, at 1168–75. However, the economic models in the study do not seem to include these subsidies.

199. According to a Congressional Budget Office analyst:

> CBO previously examined the distributional effects of a cap-and-trade program that would reduce CO_2 emissions in the United States by 15 percent. That study concluded that lower-income households could be better off as a result of the policy (even without including any benefits from reducing climate change) if the government chose to sell the allowances and use the revenue to pay an equal lump-sum rebate to every household in the United States. In that case, the size of the rebate would be larger than the average increase in spending by low-income households resulting from the higher price of energy. . . . High-income households would be worse off under that scenario (again, excluding any benefit from reducing the risks associated with climate change) because the average increase in their spending would be larger than the rebate.

Dinan Testimony, *supra* note 94, at 7.

200. *See* Tracey M. Roberts, *Mitigating the Distributional Impacts of Climate Policy*, 67 WASH. & LEE L. REV. 209 (2010). The proposed Australian carbon tax contains such a refund mechanism. *See Carbon Tax Plan Supports Low Income Australians*, PRO BONO AUSTL. (July 11, 2011, 2:08 PM), http://www.probonoaustralia.com.au/news/2011/07/carbon-tax-plan-supports-low-income-australians. The plan attempts to tie rebates to need. It provides:

> Up to $338 extra per year for single pensioners and self-funded retirees, and up to $510 per year for pensioner couples combined.
>
> Up to $110 per child for a family that receives Family Tax Benefit Part A.
>
> Up to $69 extra for families that receive Family Tax Benefit Part B.
>
> Up to $218 extra per year for single income support recipients and $390 per year for couples combined for people on allowances.

However, it is difficult to predict what the actual effects of an emissions trading system might be. Regardless of how many variables they consider, models can only ever hope to approximate reality. Even highly complex economic models may not take into account the effects of CO_2 policy on technological innovation and the development of new industries, or the differential effects climate change is likely to have on different income groups.

Despite the unresolved complexity, three major conclusions rise to the fore. First, putting a price on carbon, considered by itself, is likely to have a regressive effect. This would remain true whether a carbon tax or cap and trade is used. It would also be true for conventional regulation, which would impose even higher costs on industry that would be passed along to consumers. Second, the way we allocate allowances in a trading system has distributional consequences. Free allocation of allowances to firms benefits shareholders at the expense of consumers, with low-income consumers feeling the increased financial burden most keenly. However, auction proceeds can be used to counter the impact on low-income consumers and to make the program's impact progressive rather than regressive. Third, the possible regressive effect of emissions trading is a significant concern that should influence selection of an allowance distribution scheme and complementary tax and spending policies, but it should not derail efforts to put a price on carbon. Climate change is an urgent issue, with particularly severe consequences for the global poor. Short-term distributive problems can be resolved as a matter of program design. Therefore, if cap and trade would be effective in reducing greenhouse gas emissions, distributive concerns should not preclude use of this tool.

CONCLUSION

Emissions trading systems have been controversial since the idea first surfaced, based partly on fairness concerns. One important aspect of the debate is whether the systems are effective in reaching their primary goal of reducing total emissions at lower cost than conventional regulation. That issue has been sidelined for purposes of this Article, but its importance cannot be refuted. However, the debate also involves important issues of social equity. Those issues, which are the focus of this Article, involve normative disputes that are not easily resolved.

The normative questions are difficult and varied. Is it unfair to require firms to purchase emission rights, when they invested in facilities at a time when emissions were free? Is it fair to use an emissions-trading scheme when

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> Up to $234 per year for single parents in addition to the increased family payments they receive.

Id. For suggestions about how to deal with timing issues in such a rebate scheme, since low-income individuals may not be able to afford higher bills even if they later receive a refund, see Brian Galle and Manuel Utset, *Is Cap-and-Trade Fair to the Poor? Shortsighted Households and the Timing of Consumption Taxes*, 79 GEO. WASH. L. REV. 33 (2010).

an alternative method of controlling emissions might produce greater health benefits for disadvantaged communities? Is it fair to forego reasonable trading program modifications that could chip away at the disproportionate pollution burden suffered by many low-income and minority communities today? Should we be concerned that energy price increases related to an emissions trading system would place more of a burden on the poor than the rich because the poor spend a greater percentage of their income on basic energy needs?

These are not only important questions as a matter of principle but because they are an unavoidable part of any public deliberation over emissions trading. The question of who would be relatively advantaged or disadvantaged is important in building political coalitions for or against a proposed program. One possible advantage of cap and trade is that there are many design elements (such as whether to auction allowances or freely allocate them, how to deal with offsets, and what to do with any auction proceeds) which can be modified to address political concerns without compromising the program's core goal of reducing overall emissions levels.

Even apart from these political concerns, the normative issues are serious ones. Creating a cap-and-trade system is a major policy shift from a status quo that either consists of no regulation or conventional regulatory mandates. Such a major policy shift is bound to create significant winners and losers while (hopefully) providing an important public benefit. The question of who should carry the burdens associated with achieving societal goals is a key issue of social equity. Investors who have relied on previous legal rules in making major financial decisions and members of disadvantaged communities are not merely special interests clamoring for better treatment; they also make normative arguments that deserve careful consideration.

Although it is difficult to adjudicate sharply conflicting normative views about emissions trading, we are beginning to develop a better basis for assessing the factual issues that are linked with the normative ones. As experience with trading systems has grown and economic analysis of the issues has become more sophisticated, some normative concerns have been alleviated. The currently available information supports four main conclusions.

First, auctioning is the preferred method of distributing emissions allowances because it allows windfall benefits to be redistributed from shareholders to consumers (in particular, low-income energy consumers). However, if we consider burdening regulated sources with the cost of reducing emissions unfair, a small proportion of allowances can be freely distributed to firms in compensation.

Second, trading system designers should use case studies of low-income and minority communities to estimate the plan's side effects on conventional co-pollutants such as SO_2, NO_X, and particulate matter. Since the operation of the trading system may not be completely predictable, it may be important to investigate a range of scenarios. If this analysis suggests that the system is likely to create, exacerbate, or maintain significant pollution hot spots, regulators should employ countermeasures, such as imposing additional regulatory controls on sources that contribute to hot spots or limiting the ability of those sources to purchase allowances. Once the trading system is in operation, monitor pollution concentrations remains essential to ensuring that hot spots are not developing and that disadvantaged communities are sharing fairly in the benefits of emission reductions.

Third, the direct effect of a trading system is likely to be regressive: it will disproportionately burden low-income households with higher energy prices. Therefore, we should use auction revenues to counter this effect. In addition, through use of auction proceeds or other programs, we can encourage improved energy efficiency in low-income households to reduce the sting of price increases. One advantage of a trading system as opposed to conventional regulation is that, while both may increase prices for consumers, allowance auctioning provides a funded mechanism for countering this effect.

Finally, because uncertainties surround each of these conclusions, adaptive management is crucial. In other words, an emissions trading plan should contain specific mechanisms to study impacts and make adjustments for effects that are unexpected or undesirable. A vague commitment to the concept of adaptive management is not sufficient; specific, mandatory follow-up measures should be integrated into the initial plan where possible. Experience with cap-and-trade systems suggests that there are often unforeseen flaws that require modification after the system is in place.

The global nature of climate change implicates an additional fairness issue. There is a clear relationship between gross domestic product and CO_2 emissions, with richer countries using more energy and emitting more CO_2 than their poorer counterparts.[201] Furthermore, "emissions in some countries have imposed serious risks on others, [and, as a result,] some nations, including those in Africa, face serious risks even though their own emissions are trivial."[202] Our failure to take action against climate change is harming and will continue to harm some of the poorest people on the planet, a fact that should matter greatly to advocates of environmental justice.

If we have strong reasons to control emissions, as we do for CO_2, we should avoid getting bogged down in domestic distributional disputes to the detriment of addressing the fundamental environmental problem. However, it would not be fair to exclude domestic distributional issues from the discussion completely, even if it were politically feasible to do so. Fortunately, a growing body of information suggests that we can constructively address many fairness concerns through the design of the trading system and related policy changes.[203]

201. POSNER & WEISBACH, *supra* note 141, at 38–40.

202. *Id.* at 101.

203. A standard view among economists is that we should pick the most economically efficient regulatory approach and deal with any distributional issues that arise through the taxing and spending system. But politics do not always allow this kind of rational allocation of responsibility, and, in

Given the scope and complexity of the climate change problem, as well as the realities of politics, we cannot expect any policy response to be perfect. But we know how to design trading systems that are reasonably responsive to equity concerns. We should not hold important policy decisions hostage to the quest for an ideal response, but we need not slight legitimate concerns about social equity.

particular, modifications in the taxation system may trigger too many political sensitivities to be feasible. If so, distributional concerns should be considered in designing the regulatory system itself.